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EFFECT OF FEES ON WATER SERVICE CUTOFFS AND PAYMENT DELINQUENCIES

by

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16. ABSTRACT

A study was conducted to determine whether increased water and sewer user fees have generated increases in payment delinquencies and service cutoff rates and whether they have created other problems such as increased health hazards. Another objective was to examine the varied user-charge structures, billing procedures, and methods of debt collection in small utilities to identify procedures and policies that might minimize any negative impact of sudden fee increases on low-income customers. These data will be used to assess the impact of any rate increases that may occur as a result of small utilities raising rates to pay for new technology mandated under the Safe Drinking Water Act.

Three separate studies were undertaken. The first was a survey of management procedures and policies in 30 utilities. The second study consisted of a survey of selected low-income customers in these utility service areas to evaluate customer awareness and attitudes toward billing and debt collection techniques, to assess any possible health hazards connected with service cutoffs, and to prepare a socioeconomic profile of families likely to be adversely affected by sudden fee increases. Finally, monthly aggregate data from three utilities that had experienced fee increases were used to test the hypothesis that fee increases generate increased delinquency and cutoff rates. Water supply was concluded to be very price inelastic and no relationship was demonstrated between rate increases and customer cutoffs.

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FOREWORD

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water systems. Under a mandate of national environmental laws, the agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. The Clean Water Act, the Safe Drinking Water Act, and the Toxics Substances Control Act are three of the major congressional laws that provide the framework for restoring and maintaining the integrity of our Nation's water, for preserving and enhancing the water we drink, and for protecting the environment from toxic substances. These laws direct the EPA to perform research to define our environmental problems, measure the impacts, and search for solutions.

The Water Engineering Research Laboratory is that component of EPA's Research and Development program concerned with preventing, treating, and managing municipal wastewater discharges; establishing practices to control and remove contaminants from drinking water and to prevent its deterioration during storage and distribution; and assessing the nature and controllability of releases of toxic substances to the air, water, and land from manufacturing processes and subsequent product uses. This publication is one of the products of that research and provides a vital communication link between the researcher and the user community.

Contamination of drinking water has become a national problem of increasing concern. Small communities faced with the problem of removing these contaminants have limited resources and often cannot afford traditional treatment approaches. This report discusses possible economic impacts on a small community faced with sudden increases in rates due to a requirement to install treatment technology.

Francis T. Mayo, Director
Water Engineering Research Laboratory

ABSTRACT

Many small water and waste-water utilities in the southeastern United States have implemented large increases in water and sewer user-charges. The main objectives of this study are to determine if these fee increases have generated increases in delinquency rates and cut-off rates, and have placed a significant burden on low-income customers, and/or produced other disbenefits such as increased health hazards in the communities affected. Another objective was to examine the varied user-charge structures, billing procedures, and methods of debt collection in small utilities to identify procedures and policies which might minimize any negative impact of sudden fee increases on low-income customers.

Three separate studies were undertaken. The first was a survey of management procedures and policies in thirty utilities. Ten were rural utilities, ten were utilities having service area populations of between 10,000 and 50,000, and ten were large metropolitan utilities. A second study consisted of a survey of low-income customers in these utility service areas to obtain an evaluation of customer awareness and attitudes towards billing and debt collection techniques, to assess any possible health hazards connected with cut-offs, and to prepare a socio-economic profile of families likely to be adversely affected by sudden fee increases. Finally, monthly aggregate data from three utilities which had experienced fee increases, was utilized to test the hypothesis that fee increases generate increased delinquency and cut-off rates. Using a similar technique on individual account data in a metropolitan utility, price eleasticities were estimated for three groupings of Census Tracts within the service area.

This report was submitted in fulfillment of Contract No. CI-81-0221 by Voorhees College under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period September 1981 to September 1986 and work was completed as of February 1986.

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This report was prepared under the direction of Dr. Robert M. Clark Drinking Water Research Division, Water Engineering Research Laboratory, Cincinnati, Ohio. The report was prepared by Dr. Frank A. Brimelow and Dr. Sneh B. Veena of Voorhees College, Denmark, South Carolina.

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SECTION 1

INTRODUCTION

To raise needed revenues for the installation of adequate control technology, many small water and waste-water utilities in the southeastern United States, during the last decade, implemented large increases in water and sewer user-charges. In some instances the monthly, bimonthly, or quarterly bills of the average residential customer have doubled or even tripled in a relatively short period of two or three years.

The principle thrust of this study is to determine if these increases have increased delinquency rates and cut-off rates which may have produced significant public health and other disbenefits for communities so affected; and whether they have placed a significant hardship on certain classes of user, for example on senior citizens and others on fixed incomes, and indeed on low-income families generally.

Every utility must, of course, in order to operate effectively, recover adequate service-charge revenues. Yet there are wide variations in user charge structures, billing procedures, and debt collection policies, etc. even between utilities which have approximately the same number of customers and similar service areas. The persons most directly concerned in practice with billing and collection have been public utility officials whose orientation has tended to be, naturally enough, almost exclusively one of cost-effectiveness. It is likely, however, that some procedures and techniques are both more efficient than others in being cost-effective and in ensuring that adequate revenues are collected on the one hand; and on the other hand in placing the least burden on low-income families and being advantageous from a public health and community standpoint. An important objective of this study therefore, is to examine the social and economic impacts of various types of user-charge structures, of billing and debt collection procedures, as well as the impact of large increases in service-charges.

This has been done through three studies described in Sections III, IV, and V. The first of these studies, a survey of utility personnel, is described in Section III. The second, a survey of utility customers, is outlined in Section IV. Section V is a study of the impact of large user-charge increases on delinquency rates and on water consumption.

SECTION II

CONCLUSIONS

A few tentative observations can be made on the basis of data presented. First, it seems apparent that it is non-metropolitan utilities having service populations of between 10,000 and 50,000 persons which operate the strictest, most cost-conscious revenue collection systems. This is supported by a comparison of deliquency rates, disconnection rates, and initial deposit charges. A comparison of pricing data, on the other hand, indicates that rural utilities have the highest minimum periodic charges and M/A ratios.[1] These values appear to be sufficiently high to impact both cut-off rates and delinquency rates in rural utilities (and also in a less simple fashion those on nonmetropolitan utilities). In metropolitan utilities there appears to be only a slight relationshiup between cut-off rates and M/A ratios.

Almost all utilities require some minimum periodic charge to meet their need to recover the fixed costs for providing readiness to meet demand. A fixed monthly base charge per account which recovers only a portion of fixed costs, such as administration costs, appears to be more equitable than a minimum periodic gallonage charge. The fixed monthly base charge also offers an incentive to conserve water. Utilities using gallon age base charges may wish to review the advantages of fixed monthly administrative charges when opportunities arise to modify their user-charge structures. Variable 'tailored' price structures, discussed in Section III, which are used in a few metropolitan utilities, may have wider applications, though they involve significant transfers in the incidence of the burden or payment of utility costs.

With regard to billing methods, the following observations and recommendations can be tentatively made:

(1) Responses of low-income heads of households in Study B demonstrate that low-income customers have very little knowledge of

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[1] The M/A ratio is defined as: $$\frac{\text{the minimum residential periodic charge}}{\text{the average residential periodic charge}}$$
It indicates what fraction of the average residential periodic bill a householder needs to pay to remain a bona fide, non-delinquent customer. Thus, it gives an indication of how flexible the user charge structure is in terms of low-consumption.

discounts for prompt payment and penalties for late payment. These billing techniques therefore have little impact on the payment behavior of low-income customers.

(2) Erratic enforcement of cut-off especially when combined with long grace periods must diminish incentives to pay utility bills in a timely fashion.

(3) There is partial evidence to suggest that quarterly billing has many advantages. It lowers administration costs which ultimately can make possible the reduction of minimum charges (base charges). Yet it does not appear to increase delinquency rates, cut-off rates, and uncollectable debt. Quarterly billing may be the preferred billing method in service areas with a stable population. This is especially so in metropolitan utilities with large meter reading staffs where major reductions in cost can be made.

(4) The objection to quarterly billing is, of course, the magnitude of the bills. Study A indicates that there is much less opposition to prorating bills than is often supposed. The system of prorating quarterly bills by 1/3rds has much to recommend it.

(5) Liens are ineffective as a means of recovering utility debts. Collection agencies, however, are increasingly used, and tend to be extremely effective. There are, though, many important arguments against their use by a quasi-public authority to collect small debts (see page 55). Their use is not recommended.

All the thirty utilities in this study enforced payment of bills through disconnection as a last resort. The negative public health consequences of cut-off have been examined. They are most apparent in rural and in metropolitan service areas. Pages 74-75 in Section IV describe some of the health hazards which result from cut-offs. However, while such hazards are serious, there is no evidence for the existence of grave or widespread public health dangers. Utility officials at all levels are insensitive to the public health aspects of disconnection. It is recommended that utilities seek to increase the public health awareness of their staff. This can be done by means of short workshops which utilize the expertise of local public health professionals. Notification of public health hazards should be placed on a more regular, formalized basis in many utilities.

The policy of enforcement by cut-off does need reconsideration. Costs of disconnection and reconnection, i.e., in labor and materials and in lost user-charge revenues, are almost always higher than the reconnection fee the utility receives for reestablishing water service.[2] So both the customer and the utility suffer an economic loss.

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[2] It was found difficult to reliably estimate the average costs of disconnection, the lost revenues being almost impossible to calculate since utilities keep no record of periods of disconnection.

Evidence from Study C (Section V) indicates that deliquency rates and in some cases cut-off rates apparently increase following a substantial increase in user-charge. The evidence is clearest in the Sumter, Augusta, and Columbia data. The Columbia data also imply that fee increases result in a greater increase in relative delinquencies among low-income customers.

The 'burden' of higher user-charges is closely related to the capacity of customers to adjust their consumption to the higher charges. Accordingly the Section V the price elasticities for consumers in three difference groupings of census tracts have been calculated.

Tracts with 15% or more below the poverty line	-0.232
Tracts with 5 to 15% below the poverty line	-0.103
Tracts with less that 5% below the poverty line	-0.277
For all census tracts	-0.204

The overall value of -0.204 confirms the previous estimate of Helms and Vallery who calculated it at -0.2.[3] The differential price elasticities at different average income levels have implications for policy-making, but need further study. Section V in this study outlines a methodology for examining the burden of user fee increases on low-income consumers. This procedure can serve as a prototype for utilities as an assessment of how fee increases will affect their low-income customers.

It seems probable that the most serious disbenefits which arise from large fee increases are only in part a deterioration of the environment and attendant public health risks. At least as serious is the effect the larger user-charge increases may have in discouraging potential customers from tapping into existing water and sewer systems. One of the most striking observations made in this study was the large number of families using well-water and septic tanks, yet living in semi-urbanized areas, close to established water and sewer systems. Large capital expenditures on new treatment facilities in the last decade by many utilities have forced up the cost of tap-ins and have increased service charges to the point where there is little motivation to hook-up. Utilities where these conditions exist may wish to consider the various tap-in fee payment options discussed in Section III.

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[3] "Treated Water Demand and the Economics of Regionalization", B. P. Helms and E. F. Vallery EPA-600/2-80-162, Vol. I.

SECTION III

A SURVEY OF UTILITY OFFICIALS

After a preliminary survey of billing managers, utility engineering staff-members and other utility personnel, a rough draft of a questionnaire was drawn up, which was intended to serve as a basis for interviewing utility officials. This instrument was further modified and refined by means of extended interviews with officials from utilities of widely differing operational methods and service areas, to produce a final instrument labelled hereafter Questionnaire A (a copy of this document is attached as appendix A).

The normal research procedure used was as follows:

First, a package was mailed to the chief executive officer of each utility selected for study. This package contained:

(1) a letter of transmittal

(2) a memorandum headed "Letter to the Director of Public Works", explaining the purpose of the student conducting the interview and asking for cooperation.

(3) a copy of Questionnaire A

(4) a "Guidesheet to Key Questions", which was a three-page document defining some of the terms used in the questionnaire.

(Copies of (2)and (4) are attached as appendix B).

Later an interview was set up either with the chief executive officer or whomever that official designated as a representative. In many cases, usually at the suggestion of the officials concerned, it was found advantages to interview two persons for a shorter period of time, rather than have a single, long interview with one official. This was particularly true of the larger utilities. Finally, usually several weeks later, there followed a second, shorter interview to clear up obscure points or ambiguities; often this second interview was done through a telephone call.

The utilities were selected from a four-state area, i.e., South Carolina, North Carolina, Georgia and Florida. In selecting the 30, a balance was maintained between urban and rural utilities:

(1) ten were metropolitan utilities serving areas with an estimated population over 50,000[1].

(2) ten were non-metropolitan serving areas with estimated populations between 10,000 and 50,000.

(3) ten were essentially rural.

Other criteria were also used in selecting utilities. For example, some were chosen because they were considered to be typical. Others were chosen because they were believed to possess special characteristics, e.g. they had developed innnovations in billing or collection methods or their user charge structure was non-typical.

The sampling technique was, as indicated,purposive. The utilities chosen did not represent a statistical cross-section of utilities in the four-state region. However, an extensive range of institutional practices were examined in detail making possible an indepth, analytical-descriptive study of utility operations and of what utility officials preceive the social impacts of their procedures to be. Much of this collected information was, of course, anecdotal, and thus a considerable part of this report consists of discussions of operating experiences and novel procedures of specfic utilities that may have wider applicability.[2]

CHARACTERISTICS OF UTILITIES

A partial listing of the utilities sampled is given in Table 1. Each utility has been assigned a letter symbol to preserve annonymity. The data in the table are key items of information taken from Questionnaire A. Because of the wide variations in billing procedure and accounting methods it was found impossible to obtain all information items on the questionnaire for all utilities. For instance, several utilities used billing systems that made it difficult to distinguish between commercial and residential customer accounts; some rural utilities did not keep a record of uncollectable service charge debt as distinct from other kinds of uncollectalble debt. In cases such as these, estimates were made with the help of the officials concerned, but in some cases an estimate was not practicable.

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[1] Estimation of the population within a given service area is not always straightforward since utility service areas usually do not coincide with census tract areas or political boundaries. The number of residential accounts a utility has given some guidance. Some officials multiply that number by 4.0 to estimate the population of the service area; other estimates are also used.

[2] Because of the descriptive character of this study it was not anticipated that it would be possible to demonstrate unambiguous statistical correlations between the operational variables of utilities. Nevertheless, some correlation coefficients have been calculated. These are given in Appendix F.

TABLE 1. THE UTILITIES--BASIC INFORMATION

Utility Symbol*	Number of Customers[3]	Average Volume of Water Pumping Daily (M.G.D.)	Maxiumum Pumping Capacity (M.G.D.)	Billing Period
R1	1604	1.5	6.0	Monthly
R2	612	0.25	0.65	Monthly
R3	1418	0.8	2.0	Monthly
R4	2138	1.5	4.2	Monthly
R5[4]	1205	0.5	1.50	Monthly
R6	3025	1.31	3.60	Monthly
R7	1470	0.44	2.7	Monthly
R8	210	0.10	0.15	Monthly
R9[4]	1235	0.61	2.0	Bimonthly
R10	2749	1.0	1.80	Monthly
N1	10186	4.9	7.5	Monthly
N2	3901	1.76	2.15	Monthly
N3	9432	5.5	9.0	Monthly
N4	7100	4.01	9.0	Bimonthly
N5[4]	4872	1.8	2.6	Quarterly
N6	6424	1.7	4.0	Monthly
N7	5079	2.5	8.0	Monthly
N8	7711	7.7	18.0	Bimonthly
N9	6584	3.0	5.0	Monthly
N10	12214	7.2	15.6	Monthly
M1	134000	104.1	106.0	Bimonthly
M2	30925	22.0	30.0	Monthly
M3	58100	40.0	55.0	Quarterly
M4	66367	41.0	92.0	Monthly
M5	13900	7.2	12.4	Monthly
M6[5]	48873	23.0	36.0	Quarterly
M7	48873	55.0	112.6	Monthly
M8	46050	22.9	45.0	Bimonthly
M9	13458	9.5	22.3	Monthly
M10	14403	5.3	9.4	Monthly

*R = Rural, N = Nonmetropolitan, M = Metropolitan

[3] All customers are included, i.e. residential, commercial, and industrial. The figures given here are the number of "water users" in in-city service areas, the number of water users is almost always close to the number of sewer users, that is to say, almost all customers are hooked up to both water and sewer. In outcity service areas, there are often far fewer sewer customers.

[4] For utilities R5, R9, and N5 the number of residential customers only, in-city and outside, are given.

[5] This figure is the number of in-city residential customers

In addition to the thirty water and waste-water utilities in Table 1, several other utilities were studied because it was believed they might furnish useful information, but these interviews dealt with special features of the utilities' operation, and the information obtained from them is not tabulated, though it is sometimes referred to in discussion.

The data given in Table 1 is largely self-explanatory. It can be observed that the range of public service systems studied is quite wide: the smallest utility has 210 customers and a maximum pumping capacity of 0.15 million gallons of treated water daily (M.G.D.), the largest having, in contrast, 134,000 customers with a maximum pumping capacity of 160 M.G.D. Of the thirty utilities examined three billed their clients on a quarterly basis, five on a bimonthly basis, and the remainder billed monthly.

Date presented in Table 2, however, required more explication. The first four columns are relatively uncomplicated. The minimum periodic charge is simply the smallest dollar amount per billing period that an in-city, residential, water and sewer service cusdtomer is permitted to pay. The average periodic charge is also straightforward: it is the dollar amount paid by an in-city, residential, water and sewer service customer who consumes water at a rate of 7 kilogallons per month. Obviously in the case of a utility that has bimonthly billing these two variables will tend to be double the magnitude of monthly-billed utilities. And, of course, for utilities that bill quarterly these two variables will tend to be triple the magnitude for those for monthly-billed ones.

The estimation of deliquency rates and disconnection rates was, however, less straightforward. As defined for the purposes of this study, the delinquency rate of a water and sewer billing system was said to be the percentage of total customers, both inside and outside users, who, on a given billing date, still owed some portion of their earlier billed charges. Usually the amount a customer was "in arrears" was printed on the new billing invoice slip, and some utilities could determine quite readily the percentage of customers in arrears in the average billing period. In other utilities the information was not readily available but could be estimated through a sampling of the customers account books. On many occasions the researchers with the cooperation of billing officials, carried out this sampling themselves. The delinquency rate cited in Table 2 is an average annual rate. In one billing system where monthly delinquency rates wee obtainable over a period of time, they showed a moderate variability between billing period, but November, December, January, and August showed greater than normal variance; and this appeared to be supported by partial data from other utilities. Accordingly, the researchers, wherever possible, took an average of several billing period's delinquency rates, avoiding whenever practiable the four months mentioned above. The delinquency rate, therefore, is at best an informed estimate of the annualized rate of customer arrearages, and it is believed to be a significant variable for the description of utility operation. It ws found to vary most in rural utilities, from a high 35.5% to a low of 1.5%.

TABLE 2. UTILITIES--BILLING DATA

Utility Symbol	Minimum Periodic Charge[6]	Average Periodic Charge[7]	Deposit[8]	Reconnection Charge[9]	Delinquency Rate[10]	Disconnection Rate[11]
R1	$ 5.00	$14.00	$ .15	$ .15	3.8%	0.7%
R2	10.40	16.20	.50	.05	3.3%	1.6%
R3	7.15	11.55	.25	.10	35.5%	0.9%
R4	7.00	7.00	.25	.10	9.3%	0.7%
R5	11.50	12.50	.25	.10	12.4%	1.7%
R6	9.35	16.78	.30	.10	8.6%	2.9%
R7	15.00	16.34	.40	.10	1.5%	0.9%
R8	13.50	25.50	.30	.10	7.1%	0.5%
R9	15.00	36.60	.15[9]	.04	19.1%	0.8%
R10	7.50	16.50	.10	.10	13.8%	1.2%
N1	10.21	18.55	.15	.05	9.7%	2.9%
N2	6.50	12.80	.50	.20	14.8%	2.3%
N3	10.00	13.60	.50	.06	14.5%	5.2%
N4	14.40	46.28	.25	.10	—	0.1%
N5	17.08	49.68	.25	.10	3.0%	1.9%
N6	6.92	17.71	.50	.10	9.2%	3.1%
N7	10.35	15.07	.30	7.50	2.1%	0.5%
N8	3.96	17.37	3.96	.10	2.1%	2.8%
N9	11.25	18.45	.45	.05	8.0%	0.7%
N10	4.58	14.06	.40	.05	10.6%	.25%
M1	6.20	34.28	.50[9]	.06	8.4%	2.7%
M2	6.08	10.72	.20	.25	22.0%	1.7%
M3	14.75	47.93?	.25[9]	.25	10.7%	1.2%
M4	4.35	11.47	.00	.10	3.4%	0.3%
M5	10.76	18.62	.30[9]	.10	2.7%	2.3%
M6	9.72	29.31	.25	.05	6.70%	0.8%
M7	14.89	33.28	.00	.08	12.5%	2.5%
M8	10.83	19.06	.20	.05	11.9%	2.1%
M9	7.60	14.15	.12	.05	11.8%	3.6%
M10	3.05	16.88	.50	.10	14.7%	3.4%

[6] The minimum bill for residential water and sewer service is calculated here. This is most often done by adding the base charge for water and sewer service. In the few utility charge structures that have a minimum charge for sewer service that is not based on a minimum water consumption, a water consumption of 1 kilogallon/billing period was assumed in calculating the sewer minimum. Any sales taxes on water consumption were included in the calculation.

[7] Average residential water consumption was assumed to be 7 kgalls per month. The combined water and sewer bill was calculated using in-city rates. Any sales taxes on water consumption were included in the calculation.

[8] These are in-city deposit amounts for residential customers. They represent the deposits paid for combined water and sewer service.

[9] For utilities R9, M1, and M5, the amounts cited are advanced payments rather than deposits. For utility M3, the deposit is non-returnable.

[10] The reconnection charges listed here are the charges levied for reconnecting water service during regular working hours when no damage has been done to water lines or the water meter, etc.

[11] Methods of estimating delinquency rates and disconnection (or cut-off) rates are discussed on pages 14 and 15.

The disconnection (or cut-off) rates listed in Table 2 were also sometimes difficult to estimate. Many billing offices keep what might be called "raw cut-off lists" of households that are intended for disconnection. Yet frequently, many of the customers on the list pay their arrearages before cut-off occurs. In this study only customers actually physically disconnected and left without water and sewer service have been counted. The rate was found to vary between 0.1% to as high as the 5.2% rate of one nonmetropolitan utility (N3). Any interpretation of cut-off rates must take into account the fact that in almost every service area studied the majority of disconnections of clients who have already left the district and who therefore do not need service. Utility N3 serves a city that is a holiday resort with a large transient population.

A comparison of rural, non-metropolitan, and metropolitan utilities is suggestive. The data gives some support to the contention that it is the mid-sized, non-metropolitan utilities serving populations of between 10,000 and 50,000 persons that have the strictest, most cost-conscious revenue collection systems. Table 3, for example, illustrates that this class of utility has the highest initial deposit (average $33.40), the highest cut-off rate (2.2%), and the lowest delinquency rate (8.20%). When the averages of only the monthly-billed utilities are compared (which is a fairer comparison) then the average initial deposit is seen to be much higher ($40.00).

This observation is in general agreement with comparative data obtained from a recent survey of Georgia utilities (Table 5) which indicates that utilities serving populations of between 10,000 and 25,000 charge out-city users of water and sewer services at a much higher rate than in-city customers.

TABLE 3. AVERAGE VALUES OF CRITICAL UTILITY DATA
(Average of Ten Utilities)

Utility	Initial Deposit	Minimum Periodic Bll	Delinquency Rate	Cut-Off Rate	Reconnection Charge
Rural	$26.00[12]	$10.14	11.50%	1.19%	$ 9.40
Non-Metropolitan	33.40	9.53	8.20%[13]	2.20%	8.85
Metropolitan	23.20[12]	8.82	10.48%	2.06%	10.90

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[12] The rural utility average includes one deposit amount which is, strictly speaking, an advanced payment; the metropolitan utility average includes two advanced payment amounts.

[13] This value is the average of nine utilities.

TABLE 4. AVERAGE VALUES OF CRITICAL DATA FOR MONTHLY-BILLED UTILITIES

	Average Values				
Utility	Initial Deposit	Minimum Periodic Bill	Delinquency Rate	Cut-Off Rate	Reconnection Charge
Rural	$27.22	$ 9.60	10.6%	1.23%	$10.00
Non Metropolitan	20.00	8.54	9.84%	2.46%	8.36
Metropolitan	18.07	7.79	11.18%	2.30%	11.33

TABLE 5. CHARACTERISTICS OF GEORGIA UTILITIES[14]

Population of City Served by Utility	Sample Size (Number of Utilities Averaged)	Average Reconnection Charge	Charge differential between in-city and out-city customers at a consumption level of 3 k.galls.
Less than 5,000	226	$9.00	43%
5,000 to 10,000	24	7.25	49%
10,000 to 25,000	20	5.80	63%
Greater than 25,000	11	6.00	55%

[14] These averages have been calculated from an unpublished survey of Georgia user-charge rates carried out by the Georgia Municipal Association in March, 1982.

Several other tendencies are noticeable from a scrutiny of Tables 3 and 4. One is that metropolitan water and sewer authorities tend to require a lower deposit and to set lower minimum periodic charges. In Table 4, for example, the average deposit charge for metropolitan utilities was $18.07, much less than the average rural and non-metropolitan utilities, while the minmum periodic bill averaged at $7.79 per month. These figures agree with the observations of the interviewers. Three utility officials gave the candid opinion that there was some political pressure on the city government to keep deposits and minimum bills low. Discussions with other officials were compatible with this interpretation. A second phenoenon was that cut-off rates in rural utilities tend to be lower than in other utilities, 1.19% as compared to 2.20% and 2.06% for non-metropolitan and metropolitan utilities. Two of the reasons officials gave for this were that in small rural communities:

(1) utility employees and staff know all the customers personally, a fact that makes them less willing to disconnect,

(2) the number of customers in many rural areas represents an inadequate revenue base with the result that many officials are unwilling to further reduce the base by disconnection even if a family is frequently in arrears.

USER CHARGE STRUCTURES

Water and waste-water user charge structuring has undergone modest change since the enactment of the Safe Drinking Water Act of 1974 (PL 92-523) and the Water Pollution Control Act of 1972 (PL 92-500). Basically, these changes have been in response to higher treatment levels and the correspondingly higher capital and operating maintenance costs.

An important effect of the federal programs has been the emphasis on user charge equity in the development of wastewater user charges for grantees under PL 92-500. This emphasis on equity appears to have had an impact on water user-charges also.[15] Basically, the E.P.A. regulations require that customer be charged in direct proportion to the benefit received from the service provided. This equity requirement has usually been interpreted to call for, in the case of wastewater services, user-charges which are based on a uniform charge per unit of volume returned to the waste stream. For water service it implies a uniform "flow charge" per unit of water consumed.

The historical approach to pricing, however, has been that of declining block charges in which charges per unit of consumption decline at higher consumption (or discharge) levels. Declining block rates are a carry over from the electric utility industry and there is substantial literature on such structures and on their associated levels of equity.[16] Based upon rate-structuring techniques of the electric utilities industry, several steps (consumption/discharge volume levels) are established from a cost of service approach. At each step a user-charge per unit of volume is established. Some structures have five or more steps with the highest volume step applying to large commercial-industrial users. The effect is to charge such large users the lowest rate (among those for the several steps) for all of their service in excess of the highest volume step.

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[15] Report by R. Stubbs, Inc., Financial Analysts, February, 1982.

Those who support declining block structures hold that production costs at the higher production level are, of course, much lower, and hence the unit charge per unit of consumption should be lower. Proponents of such structures also argue that the higher charges per unit at the lower consumption levels partially offset the higher fixed costs that the utility incurs in providing the capacity to meet expected demand at that level of consumption. On the other hand, one of the arguments against this type of rate structure is that it has a negative conservation effect. There is little incentive to conserve water usage under a declining block user-charge pricing regime.

In practice, for most utilities the declining block volume charge structure with a minimum monthly charge is the water charge structure most often encountered. Wastewater charge-structures have most commonly a uniform volume charge with a minimum monthly charge. These minimum monthly (or periodic) charges are a significant part of the monthly payment for residential customers. They are usually justified as being necessary to protect the utility from the fixed expenses it incurs independently of the volume of usage. These fixed costs may include both operating and non-operating costs (for example administrative costs and capital costs). But there are no generally accepted criteria for determining the precise level of fixed costs reuquired to provide readiness to serve potential demand. Yet it is generally agreed that some level of recover of fixed costs is equitable.

Utilities normally recover fixed costs for readiness to serve potential demand through either minimum gallonage charges or through fixed monthly base charges per account. In the first type of minimm charge the customer is charged for a minimum gallonage. This minimum consumption varies between utilities, but is usually set somewhere between 2,000 and 5,000 gallons. Monthly consumption above minimum gallonage is normally charged at the prescribed price per unit. The minimum monthly gallonage structure is generally held to be in noncompliance with the Environmental Protection Agency's regulations on wastewater user charge under PL 92-500. It can be critized on the grounds that:

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[16] See example Trebing, H. M., Essays on Public Utility Pricing and Regulations. East Lansing: Michigan State University Institute of Public Utilities. 1971 and Hirsch, W. A., The Economics of State & Local Government, McGraw-Hill, New York, 1970.

(1) ultrasmall users are charged for service that they do not utilize,

(2) user-charge at the low range of service are significantly higher per unit than at the higher ranges.

Fixed monthly base charges per account may be more defensible. They are generally applied to recover some portion of the fixed expenses incurred by the utility, for example, the costs of administration and of debt service. In the typical case, fixed monthly base charges per metered account are designed to recover only a portion of the justified fixed expenses incurred by the utility. For instance, in some cases only administration expenses are recovered by the monthly base charge.[17] Thus, they are often smaller than minimum gallonage charges. In addition under this type of regime the ultrasmall user perhaps of 2 or 3 kgalls per month will pay less for having consumed at a low level.

All of the utilities surveyed in this study levied a water user charge in the form of a declining block volume charge in combination with either a minimum gallonage or a fixed base charge (the latter were in a minority). Essentially all the utilities in the sample levy wastewater user-charges in the form of a uniform volume charge with a base charge or a minimum gallonage (the latter were in the minority). Several utilities in the sample levy a maximum wastewater charge and one has a seasonably determined charge.[18]

The declining block volume charges encountered in this study are of several kinds. Most often declining rates did not take effect except at consumption levels above 10 kgalls per month. Under this type of regime, the great majority of residential customers pay for all the water they consume at the same rate. There is a certain equity in this type of schedule. A few utilities, however, levy declining rates even at low consumption levels. One large metropolitan utility has the following residential charge structure for the first 7 kgalls of water used:

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[17] The term Administration Costs as used here means "support services", i.e. all operating costs which support but are not directly chargeable to the production of water and the treatment of wastewater, e.g. general administration, accounting and collection, and meter reading. These costs can amount to approximately 30% of total operating costs in large municipal utilitties. See "Labor Wages Rates Productivity, and Cost of Water Supply", R .M. Clark, Journal of the American Waterworks Association, Vol. 71, No. 7, July 1979. Also, The Cost of Water Supply & Water Utility Management, R. M. Clark, J. I. Gillean, E.P.A. Publications 600/5-77-051a, November 1977.

[18] One utility has a flat water charge for all residential users, which is independent of the volume of water consumed.

Volume Consumed kgalls		Charge per gall (Not including Wastewater Charges)
2 (minimum)		$5.40 (minimum)
3rd Kgallon		1.16
4th Kgallon		0.75
5th Kgallon		0.75
6th Kgallon		0.65
7th Kgallon		0.65
	Total	$9.36
	High volume rate	$0.54

An alternate type of variable "tailored" structure was encountered in another metropolitan utility:

Volume Consumed Kgalls[1]	Charges per Kgall[19] (Not including Wastewater Charges)
0 to 3 (minimum)	$1.036 (minimum $3.18)
3 to 15	1.560
High volume rate	0.641

According to utility officials the $1.036 rate was intended to ease the payment burden of low-income and fixed income customers. The low rate of $0.64 at high consumption levels reflected both the lower costs of distribution and treatment at high volume and a desire to attract industry. It must be noted, of course, that such variable price structures shift the incidence of utility costs and involve serious equity considerations.

From the perspective of very low-income customers the magnitude of the minimum monthly, bimonthly, or quarterly bill is of critical importance since most such families tend to consume at very low levels. Thus one way of comparing the sensitivity of a given utilitiy's user-charge structure to the needs of low-income users is to measure the ratio.[20]

$$\frac{\text{Minimum Periodic Charge}}{\text{Average Periodic Charge}}$$

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[19] These values have been converted from a price schedule based on units of one hundred cubic feet (C.C.F.)

[20] See Table 2. The terms in this ratio have been defined previously.

In utility service systems where this ratio has a low value, low-income families and persons on fixed, low incomes can remain bona fide customers even though they pay only a small fraction of the monthly bill of the average residential user. Table 6 gives a comparison of these ratios.

In figures 1 through 3 the minimum/average periodic charge ratio (M/A ratios) for the three categories of utility have been plotted against disconnection rates. Only in the case of rural utilities does there appear to be a slight correlation between disconnection rates and M/A ratios, although there may be a slight correlation in the case of metropolitan utilities. For non-metropolitan utilities there may be a slight inverse correlation.[21]

Thus the relationship between M/A ratios and disconnection rates is not simple. One may argue, however, that it is the absolute magnitude of the minimum periodic charge that impacts low-income customers most directly and might be expected to have the greatest effect on disconnection rates. When minimum periodic charges are plotted against disconnection rates, the rural utilities again appear to show a light positive correlation (Figures 4-6). But the metropolitan utilities also may show a weak positive correlation. There is no apparent correlation for metropolitan utilities. Finally, Minimum/Average charge ratios were plotted against Delinquency Rates (Figures 7-9). Delinquency rates tended to increased at a higher M/A ratios for both rural and nonmetropolitan utilities. No relationship was apparent in metropolitan utilities.

Perhaps the most obvious interpretation of the above results is that it is only in rural utilities where minimum monthly charges tend to be highest and where M/A ratios also are highest[22] that an impact on both cut-off and delinquency rates becomes apparent. This view is supported by the fact that rural low-income families have much lower levels of disposable family income than low-income families in an urban environment.[23]

Explanation of the apparent trends for non-metropolitan utilities is not so simple. Disconnection rates appear to decline with higher M/A ratios (Figure 7-9). (Perhaps in these utilities there tends to be an inverse relationship between delinquency rates and cut-off rates: those utilities which cut-off customers most readily [and have high cut-off rates] tend to have low delinquency rates). Be that as it may, cut-off rates do appear to increase with increasing minimum periodic charge (Figure 2). It seems probable that in metropolitan service areas any effects of high minimum periodic charges and high M/A ratios are masked by other factors such as the varying lengths of the billing period, and the existence of discounts for prompt payment, etc. These factors wil be discussed further.

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[21] Sample size, however, is too small for statistical correlation. Appendix D.
[22] See Tables 3, 4 and 6
[23] U.S. Census data. 1980 Census.

TABLE 6. MINIMUM CHARGE CHARACTERISTICS OF UTILITIES

Utility Symbol		Ratio Minimum Periodic Charge Average Periodic Charge
R1		0.36
R2		0.64
R3		0.62
R4		1.0
R5		0.92
R6		0.56
R7		0.92
R8		0.53
R9		0.41
R10		0.45
	Average	0.64
N1		0.55
N2		0.51
N3		0.74
N4		0.31
N5		0.34
N6		0.39
N7		0.69
N8		0.23
N9		0.61
N10		0.33
	Average	0.47
M1		0.18
M2		0.57
M3		0.31
M4		0.38
M5		0.58
M6		0.33
M7		0.45
M8		0.57
M9		0.54
M10		0.18
	Average	0.41

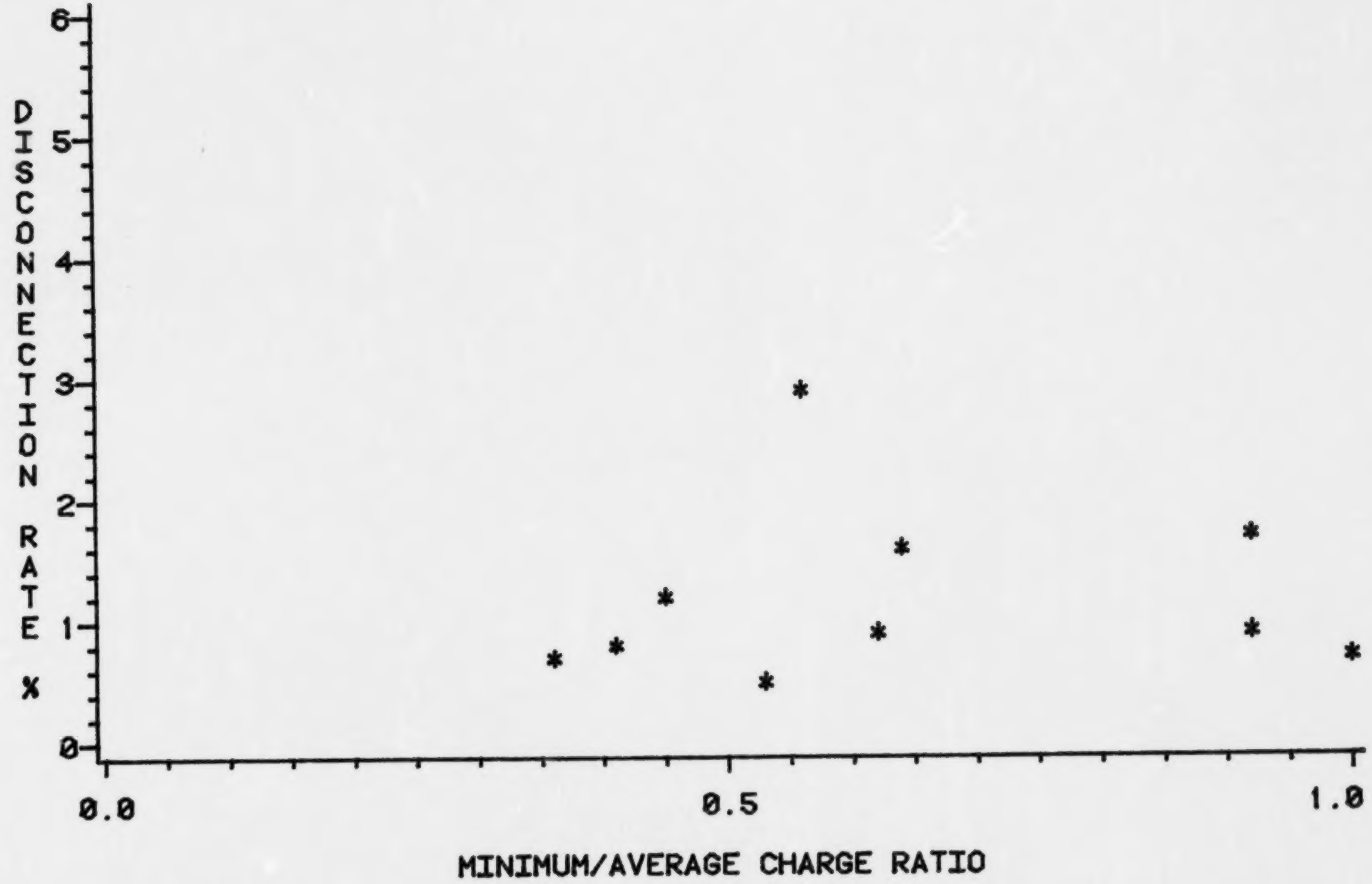

FIGURE 1 DISCONNECTION RATES VS. MINIMUM/AVERAGE PERIODIC CHARGE RATIOS FOR RURAL AREAS

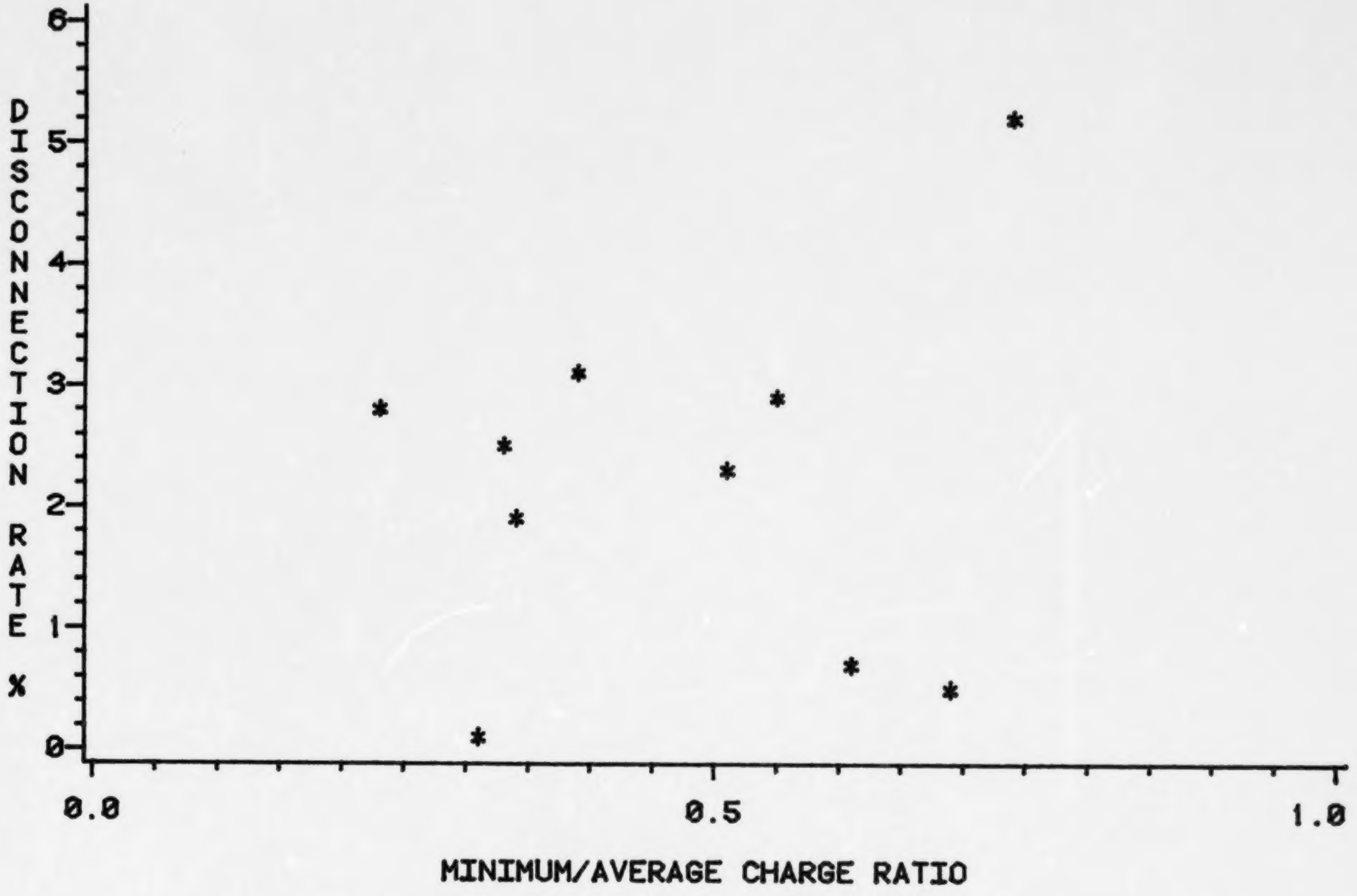

FIGURE 2 DISCONNECTION RATES VS. MINIMUM/AVERAGE PERIODIC CHARGE RATIOS FOR NONMETROPOLITAN AREAS

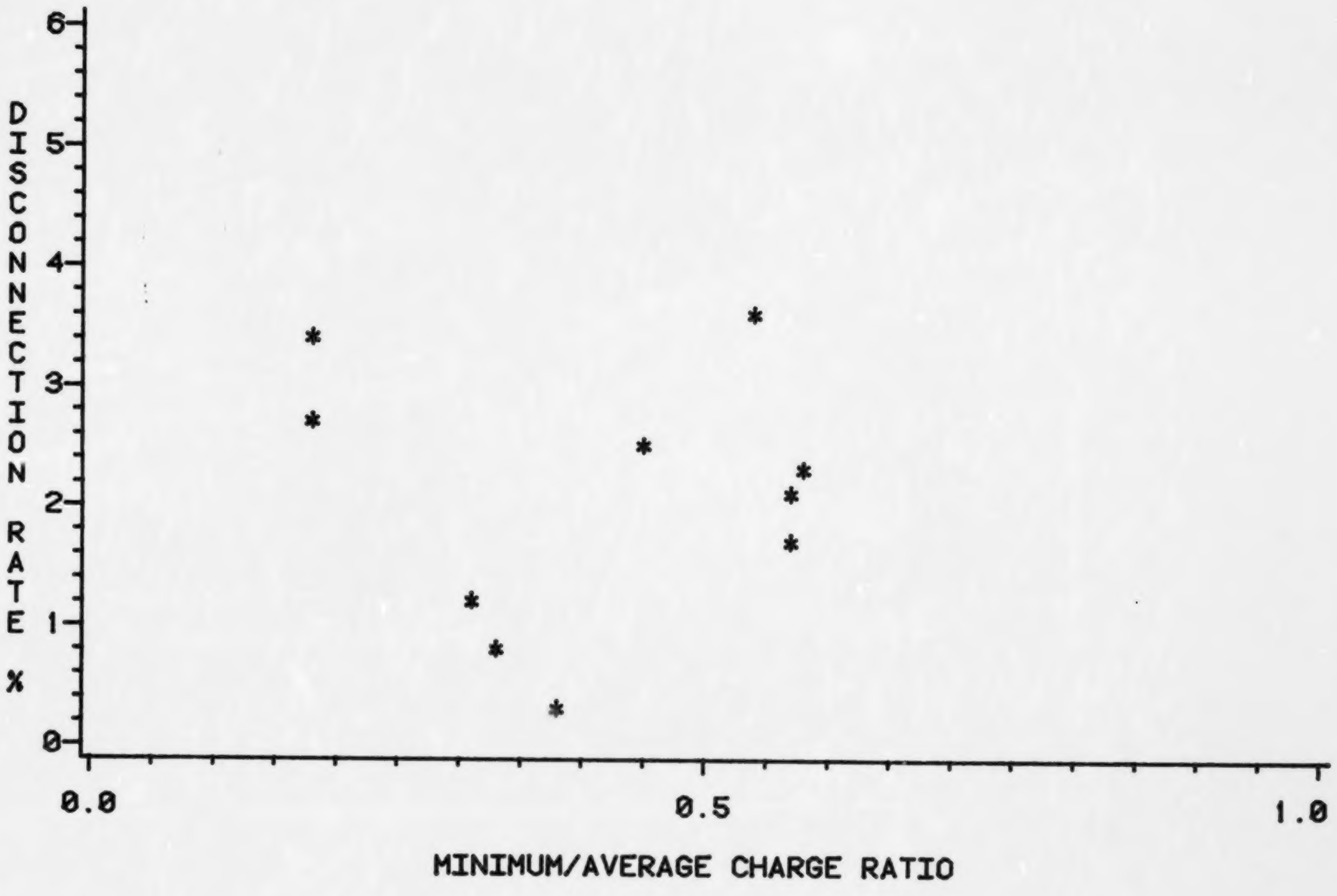

FIGURE 3 DISCONNECTION RATES VS. MINIMUM/AVERAGE PERIODIC CHARGE RATIOS FOR METROPOLITAN AREAS

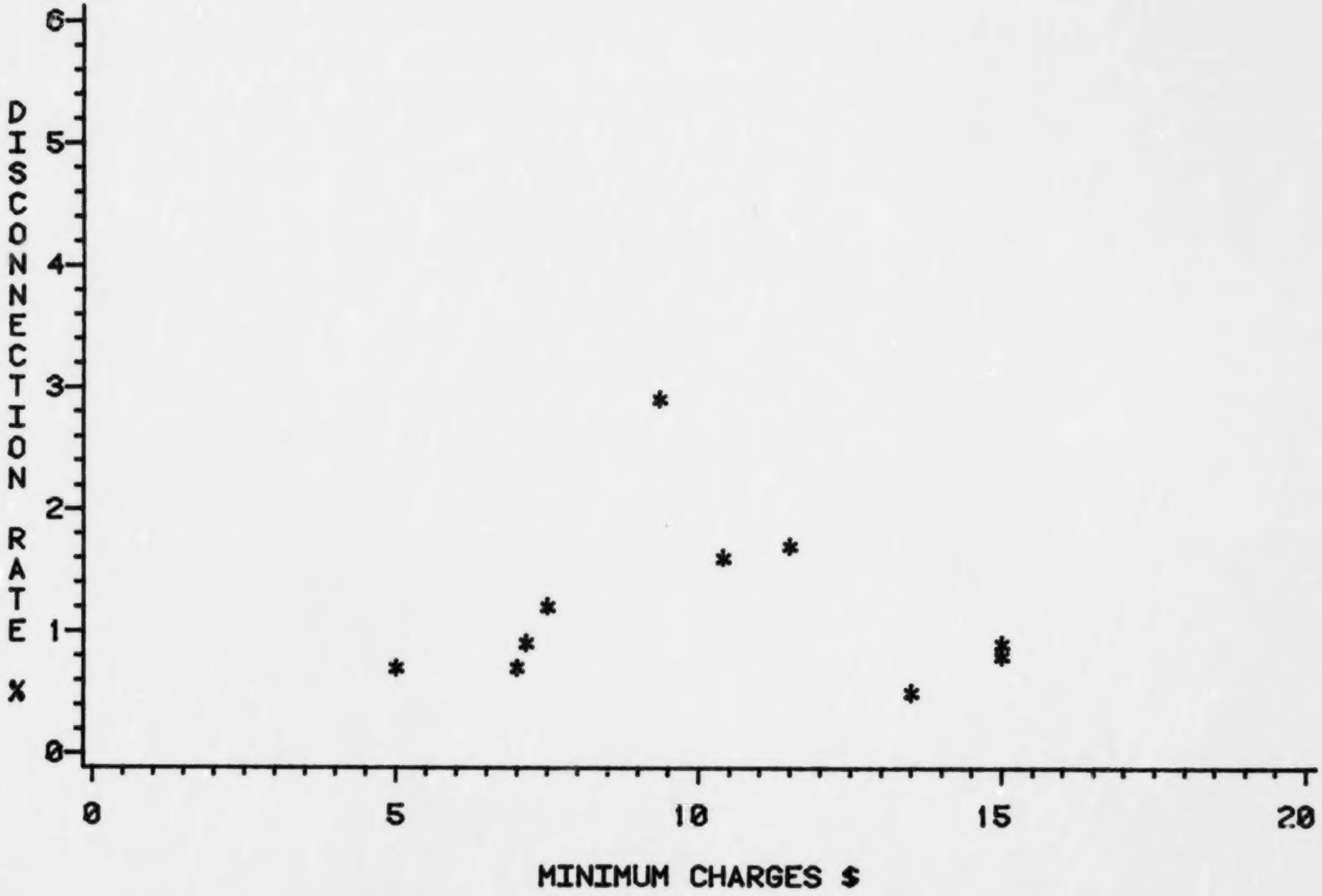

FIGURE 4 DISCONNECTION RATES VS. MINIMUM PERIODIC CHARGES FOR RURAL AREAS

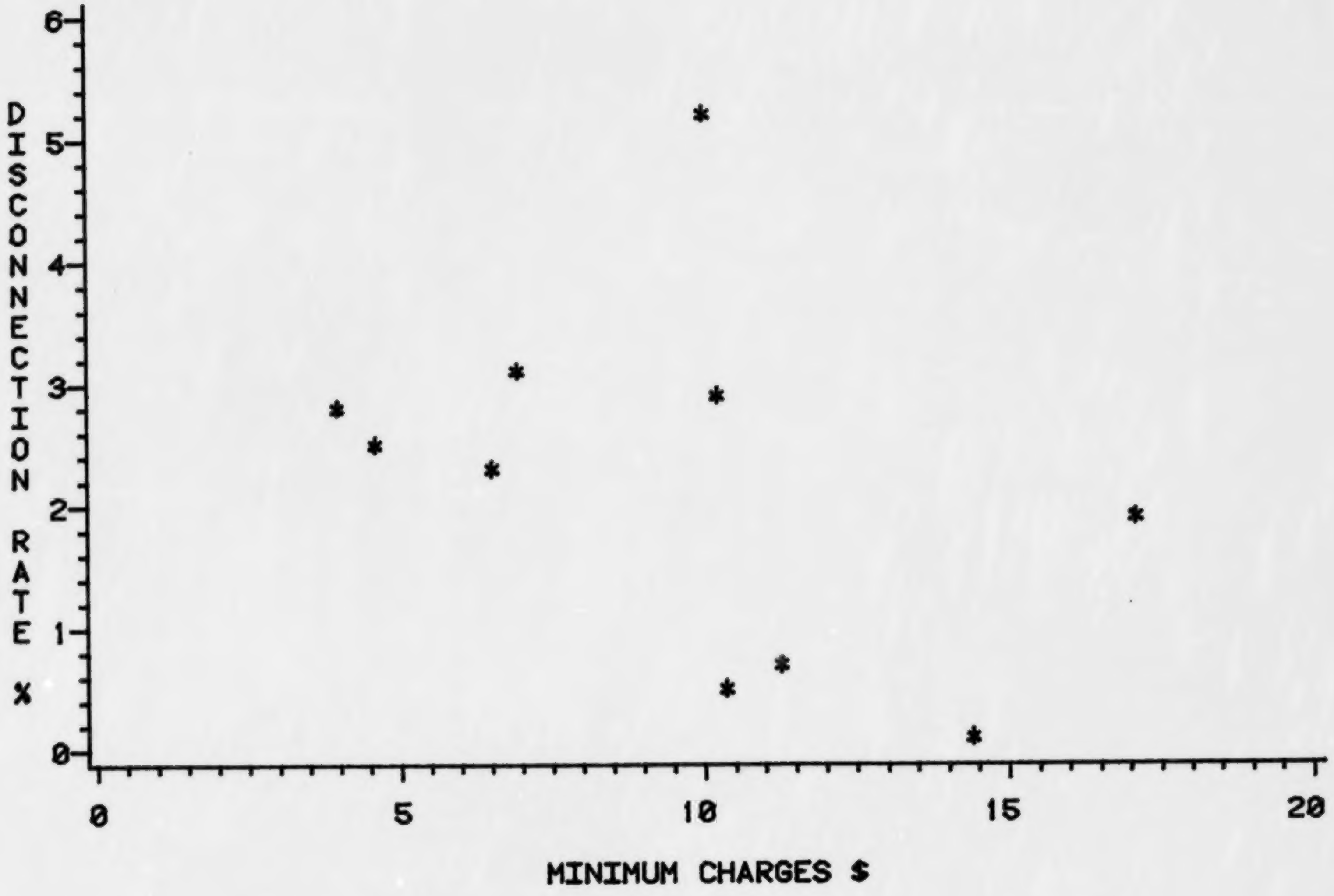

FIGURE 5 DISCONNECTION RATES VS. MINIMUM PERIODIC CHARGES FOR NONMETROPOLITAN AREAS

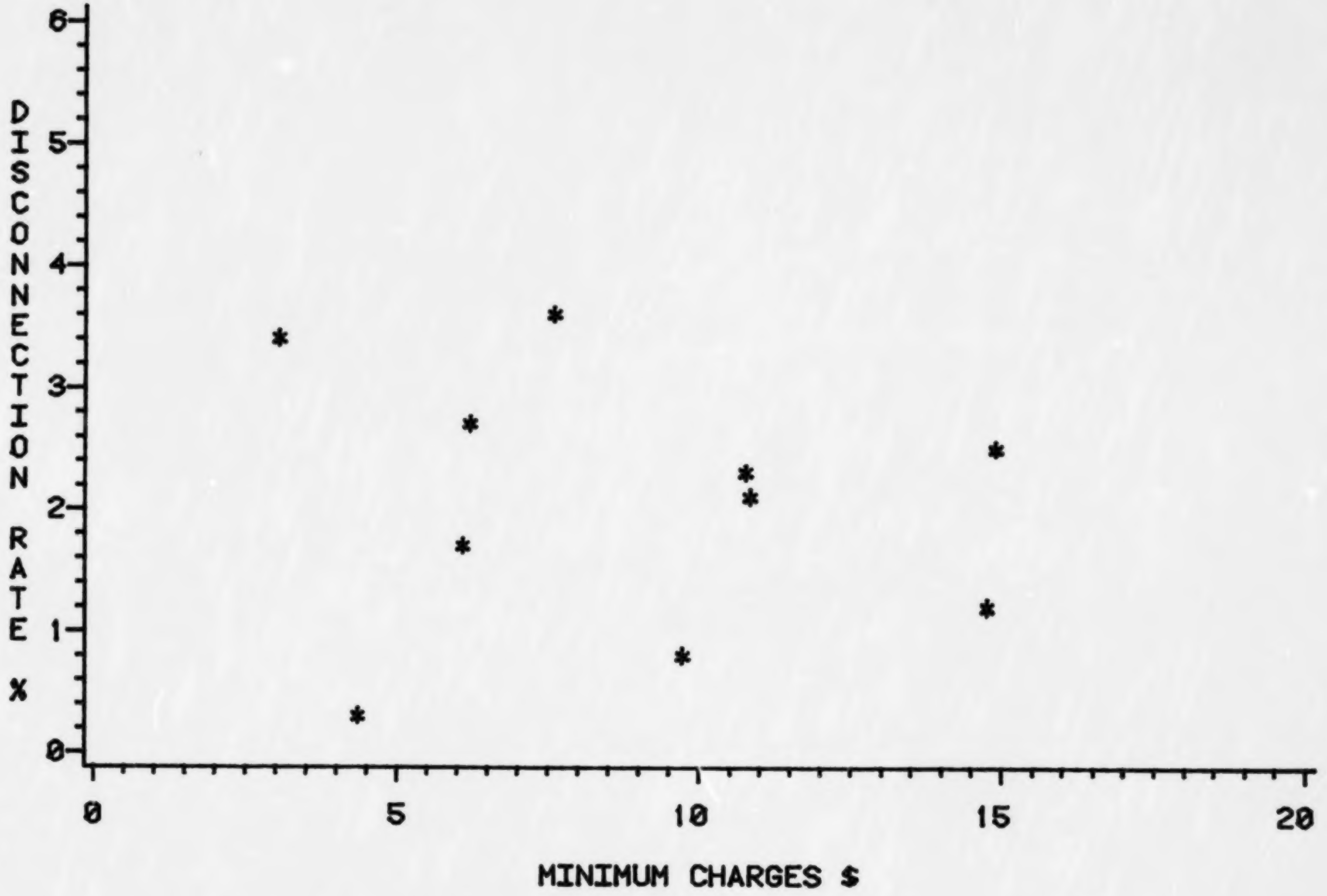

FIGURE 6 DISCONNECTION RATES VS. MINIMUM PERIODIC CHARGES FOR METROPOLITAN AREAS

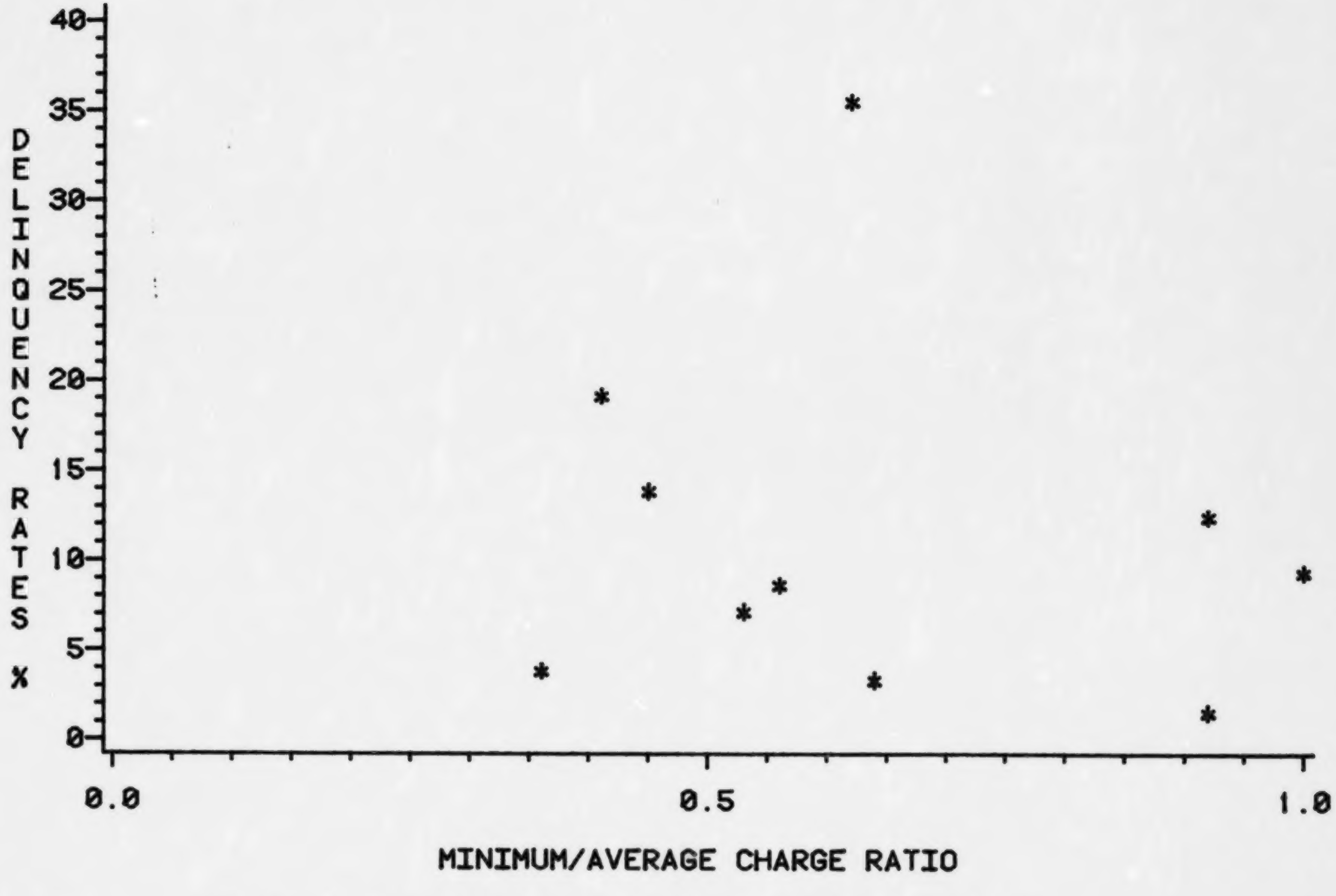

FIGURE 7 DELIQUENCY RATES VS. MINIMUM/AVERAGE PERIODIC CHARGE RATIOS FOR RURAL AREAS

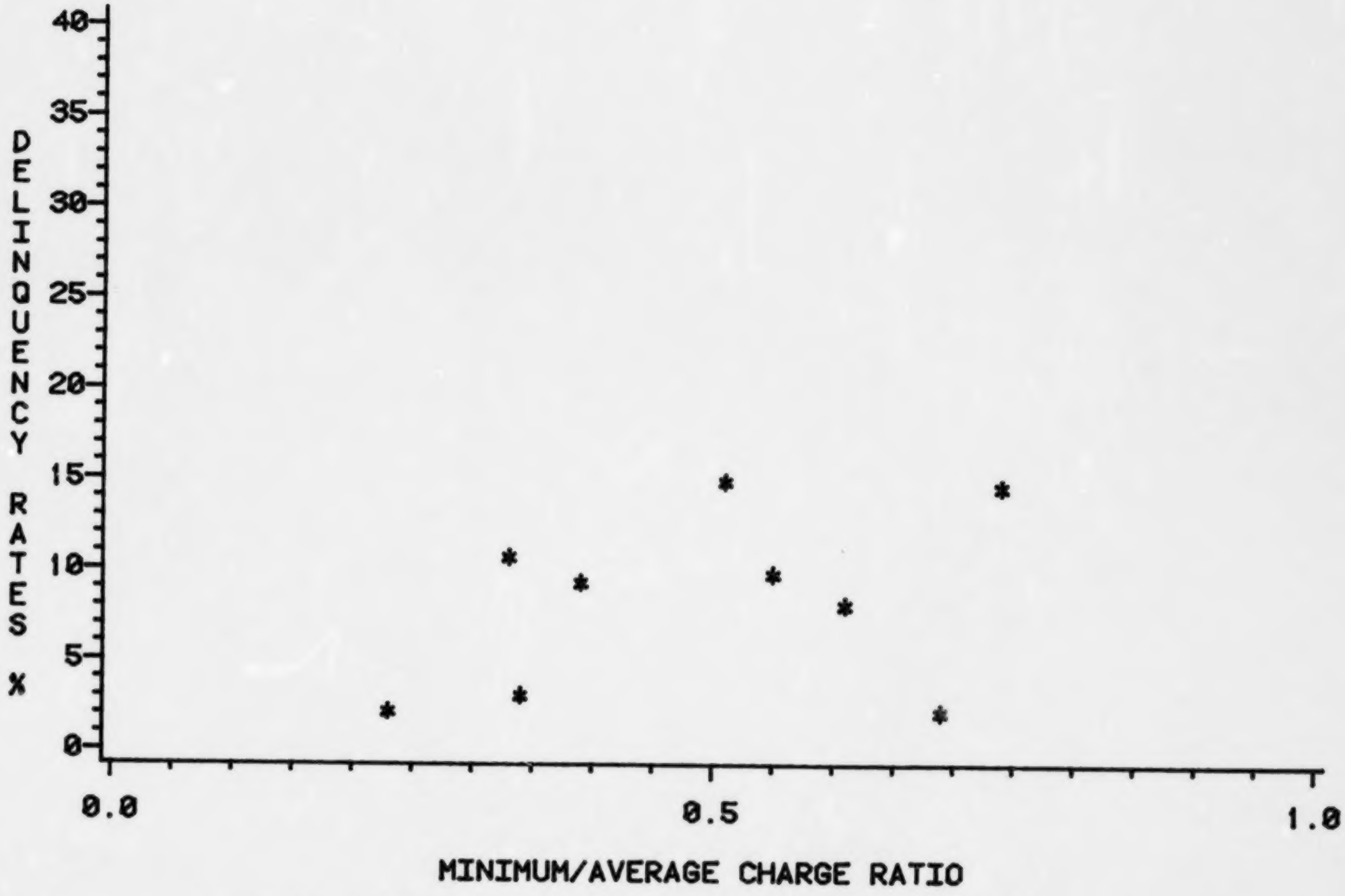

FIGURE 8 DELIQUENCY RATES VS. MINIMUM/AVERAGE PERIODIC CHARGE RATIOS FOR NONMETROPOLITAN AREAS

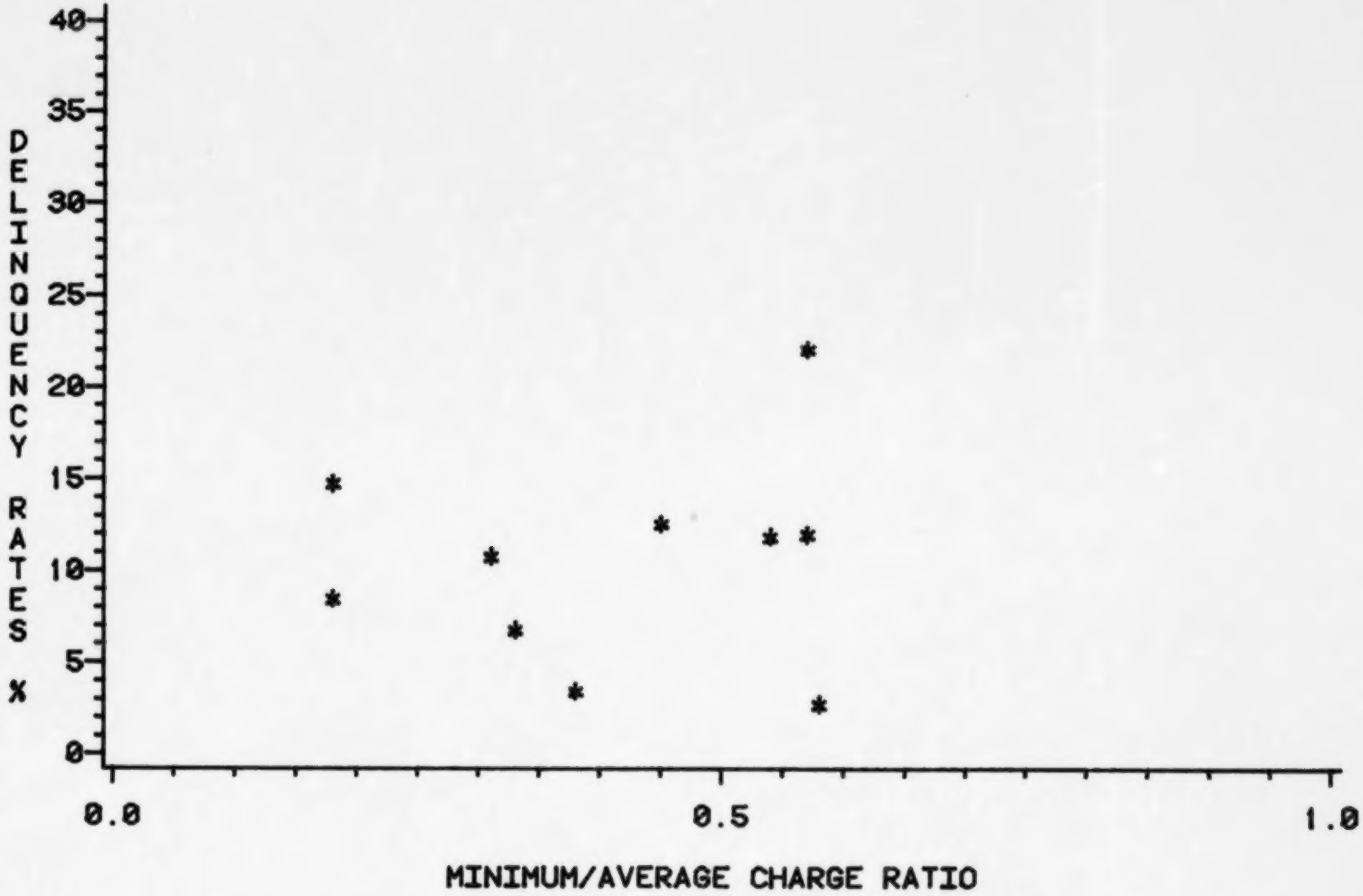

FIGURE 9 DELIQUENCY RATES VS. MINIMUM/AVERAGE PERIODIC CHARGE RATIOS FOR METROPOLITAN AREAS

METHODS OF COLLECTION

The methods of revenue collection which public water and wastewater utilities use to recover costs are extremely diverse. Generally, a utility bills its customers at the beginning of each billing period and expects payment by check or personal visit to the billing office by a certain due date. Larger utilities have many billing cycles with due dates appropriately staggered. To encourage prompt payment some utilities offer a 5 or 10% discount if the bill is settled quickly, typically within 10 or 15 days. If the bill is not paid in full by the due date, however, a notice of arrears is usually sent out. Often this is done when the next billing period begins. A new bill is sent out showing the arrearage owed, with an attached slip warning that disconnection will occur if payment is not made by a certain date. There is frequently a late payment penalty of 5 or 10% or sometimes a flat $5.00 charge added to the bill. Should the bill still remain unpaid, many utilities send out a second warning threatening cut-off within a short period of perhaps two or three days. At the end of this time the customer is placed on a "raw cut-off list" which is turned over to the engineering staff for action. The customer can prevent disconnection at any time during this lengthy procedure by payment in full. Even customers placed on the cut-off list may avoid it by a hurried visit to the billing office, although they usually have to pay the reconnection charge as well as the owed bill. For the purposes of this study the total length of time between the mailing of the original billing and the actual scheduled physical disconnection of a customer, i.e. the period of time, in days, a customer is legally permitted to defer payment without cut-off is referred to as the "grace period". It varies from as long as 136 days (over four months) in one quarterly-billed metropolitan utility, to 20 days in a monthly-billed non-metropolitan utility.

Yet cut-off at the end of the grace period is not always certain. Several utilities indicated that, as a practical matter, more subjective factors also influence the decision to disconnect a customer. The factors mentioned were:

(1) availablity of labor to carry out the disconnection

(2) the work load of the billing department

(3) the amount owing (one utility will not disconnect unless the arrearage exceeds $50.00)

(4) the need to take in revenues (cash flow).

Whether the uncertainty caused by erratic enforcement of utility procedures or municipal codes is important is difficult to assess. But it does raise the question of fairness. And it may be an underlying cause of the dissatisfaction which many low-income customers express concerning utility service (see Study B). Also, if customers in low-income neighborhoods become aware that they may not be disconnected at the end of the grace period, this diminishes the pressure on them to meet their utility bills. Long grace periods, as such, however, are not necessarily unhelpful to low-income clients. They afford families with problems of irregular income caused by unemployment, or under-employment, or sickness more time to make payment. However, the particular combination of long grace periods and subjective or erratic enforcement of cut-off may provide a significant disincentive to meet utility bills.

While the uncertainties caused by a utility's erratic enforcement of its stated procedures may often be disfunctional, flexibility in some matters may be constructive. All the utilities studied sometimes accept partial payments or will occasionally permit late payment. Many of the officials interviewed expressed unease about this and pointed out that no municipal ordinance empowered them to do it. Nevertheless, in every utility, mechanisms existed for assisting customers who could not meet their bills. Most billing departments required that the customer make a personal appearance in the billing office and give reasons why the utility should accept a partial payment or why payment should be deferred. Reasons usually found acceptable were sickness, a death in the family, or unemployment, while sometimes vaguer explanations such as 'emergency situation' or 'extreme hardship' or 'undue burden' were acceptable. All utility departments used a case by case approach and the payments-record of the customer was usually taken into consideration. No utility had a written policy on the subject. Some billing officials required that a written payment plan be signed by the customer. This was true of only one rural utility, but was common practice in four of the ten non-metropolitan ones and five of the ten metropolitan ones. Most often the billing manager made the decision, though sometimes the billing clerks could do it. In one rural utility, the city council had to first approve. At the other extreme, three utilities permitted billing officials to accept partial payments without requiring any explanation from the customer. Almost all utilities, however, immediately cut-off families who failed to live up to payment plans they had made, whether written or unwritten.[24]

BILLING PERIODS

One feature of revenue collection which attracted interest is the optimum length of the billing period. From the perspective of low-income clients revenue collection methods which include the smallest minimum charges or non-minimum charges at all would be preferred. As noted previously, minimum gallonage or minimum base charges represent an attempt to recover a part of the fixed costs necessary to provide readiness to meet demand. They are frequently recovered as 'administration costs' or 'support services costs'; and some of the main components of these costs are meter-reading expenditures, postage, and other billing related outlays. Thus, from the point of view of reducing minimum charges, quarterly-billing would appear to have advantages.[25] If meter reading and the billing process takes place once each quarter instead of once each month 'administrative costs' could be reduced.[26]

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[24] For a study of cut-offs in a large metropolitan area see Clark, C. Scott and Judson, H. R., "Analysis of Delinquent Residential Water Account Shut-offs", Journal of the American Waterworks Association, May 1975.

[25] Though, of course, quarterly billing means larger bills. This will be discussed lated.

While most billing managers agreed that quarterly billing would reduce administrative costs, a few had strong reservations about its overall benefits. Several officials in rural and non-metropolitan utilities doubted that it would save much apparently since they considered their meter-reading staff to be already at a minimum. But the main objections were that meter readers have a monitoring function; and it was predicted that quarterly billing would raise delinquency rates and create a greater loss of revenue through leaks. (This latter was of considerable concern to officials in two old metropolitan areas where many of the homes have ancient plumbing.) Additionally, it was predicted that the rate of uncollectable revenue would increase, since many more customers would leave the water service area in between billing dates leaving unpaid balances.

The data collected in this study do not bear out these predictions. Table 7 compares delinquency rates, cut-off rates, and percentage uncollectables by type of billing system.

TABLE 7. AVERAGE DELIQUENCY RATES, DISCONNECTION RATES, AND PERCENTAGE UNCOLLECTABLES BY TYPE OF BILLING SYSTEM

	Monthly-Billed Utilities	Bimonthly-Billed Utilities	Quarterly-Billed Utilities
Average Deliquency Rate (%)	10.5 (22)	10.5 (4)	6.8 (3)
Average Disconnection Rate (5)	1.9 (22)	1.7 (5)	1.3 (3)
Average Pere=centages Uncollectables	0.71 (18)	0.66 (4)	.76 (3)

The tabulated data are unfortunately too fragmentary to indicate any trends. For instance the apparent decline of average cut-off rates from 1.9% to 1.3% and of average delinquency rates from 10.5% to 6.8% is not significant because of sample size.[27] Nevertheless, it can be tentatively inferred from the date in Table 7 that the differences in deliquency rates, cut-off rates, and uncollectibles between different types of billing systems are not great.

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[26] The best estimate we obtained was from one non-metropolitan utility which estimated that $2.72 per account per month could be saved through quarterly billing.

Thus there is some evidence (though very incomplete) that bimonthly and quarterly billing periods do not increase delinquency rates, cut-off rates, and uncollectibles to unmanagerable levels as some officials in monthly-billed utilities predict.[28] A case can be made, therefore, that monthly-billed utilities consider converting to quarterly or bimonthly billing systems in order to save administrative costs. Each utility service district, of course, possesses its own unique characteristics and customer population and no generalizations are possible. However, consideration of such a change would be appropriate in utilities where no special reasons exist which would magnify the importance of monitoring functions of meter readers. Such a change would not be appropriate, for instance,in a service area that has a large transient population, e.g. in a vacation resort; or in a service area which includes large members of old buildings prone to plumbing leaks; or in a service area where the distribution system itself is dilapidated and leak prone. Of course quarter bills are typically almost three times as large as monthly bills. It would not seem advisable to introduce quarterly billing in rural service areas where both cut-off and delinquency rates are impacted by high minimum charges and M/A ratios (see page 3). Quarterly or bimonthly rates do not seem to be very sensitive to high minimum charges which have large staffs or meter readers permitting significant reductions in administrative costs to be made.[29]

One billing method which should be considered is a system of quarterly billings with monthly prorating. This system has been used successfully for many years in R5, a medium sized rural utility. Under this method of billing, the meter is read once each quarter, but each customer receives monthly bills. In the R5 service districts a residential customer receives two monthly bills at the minimum charge level (i.e. the charge for a minimum gallonage of 5 k galls). During the third month, the meter is read and the third month's bill includes the minimum gallonage charge plus the charge for any water used over the minimum. The chief objection to this system is that the bills tend to be uneven; the end-of-quarter monthly bills is generally fairly high for the typical household that uses, on average, more than 5 k galls per month.[30] One way of obviating this is to set a high minimum gallonage, which will tend to even out the bills (in fact 5 k galls is higher than most minimum gallonages volumes). Setting a high minimum gallonage, however, raises the question of equity for small users as discussed previously. Another way of avoiding uneven bills is to read the meter at the end of each quarter and bill the customer one-third of the quarterly bill for three months. This method of prorating has the disadvantage that the utility receives delayed payment for the water and wastewater service it provides.

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[27] In the four-state target area of the study, there were very few utilities with multi-monthly billing periods, and many if these could not be sampled because they were only water utilities, with no wastewater operations, or because they relied on other utilities to do part of their billing.

[28] In all, seven officials mentioned the likelihood of increased delinquencies, or increased uncollectibles, or increased losses of water through leakage, though several of these put it forward as a possibility rather than as a prediction.

[29] In rural utilities the meter readers often carry out many other tasks and sometimes their time is not fully occupied. Thus any savings realized by reducing the meter reading function may be quite minimal.

A major deterrent to the adoption of prorating systems such as the one just described is the general opinion that prorating is unpopular with consumers. The results of this survey do not bear this out, however. Almost all billing officials use prorating from time to time in order to estimate bills in such circumstances as:

(1) when a leak has caused serious water losses which cannot be charged to the customer

(2) when the meter cannot be read due to mechanical failure or extreme weather conditions

(3) where meters have been tampered with.

Often a 3 month or a 6 month historical average will be calculated and the customer billed accordingly. In Questionnaire A, the officials were asked to appraise customer acceptance of prorating generally, and their responses were evaluated as positive, neutral, or negative (Table 8).

TABLE 8. CUSTOMER ACCEPTANCE OF PRORATING

	Positive	Neutral	Negative
Rural	6	3	1
Nonmetropolitan	5	1	4
Metropolitan	6	2	2

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[30] Significantly, R5 once used this billing system for commercial and industrial customers as well as residential ones. But the auditors suggested that the unevenness of the bills was an inconvenience for large users and a more traditional system is used for commercial accounts. The system appears to work well for residential accounts, however.

Thus in rural and metropolitan utility areas there is little resistance to prorating, and billing systems which include prorated bills are worth consideration if they substantially reduce administrative costs. This finding is supported by the responses of low-income customers in the household survey (Section IV). A brief survey instrument which billing officials can use to evaluate customer attitudes towards prorated bills is included as Appendix A.

When analyzing some of the basic data, other factors than the length of the billing period appear to have greater effect on customer behavior. For example, almost all the utilities required deposits for water and sewerage service which vary between $0 and $50. Their annual uncollectible service charge debt varies between 0.02 and 1.86%. These two variables are plotted separately for rural, nonmetropolitan, and metropolitan utilities in Figures 10-12. For rural utilities there appears to be an inverse relationship between the two. Generally, the higher the deposit, the lower the uncollectible debt. This tentative result is not especially unexpected since utilities use deposits to absorb unpaid service charges when a customer moves from the locality. However, no inverse relationship is apparent for nonmetropolitan and metropolitan utilities. The fact that it appears to be true for rural utilities has broader implications. Generally, in the long term all customers of a utility absorb the uncollectible debt. They are normally considered part of administrative costs and are recovered through base charges. Base charges almost certainly have a greater relative impact on low-income families than do volume or flow charges and they appear to have an impact on deliquency rates in rural utilities. Thus it seems reasonable to recommend that rural utilities establish fairly high deposit charges so as to minimize losses of uncollectible revenue which will, over a period of time, enable them to reduce their minimum charges. For low-income tenants it is usually the landlord who pays the deposit. In the case of nonmetropolitan and metropolitan utilities no such case for high deposits can be made.

One might anticipate some relationship between discounts for prompt payment and deliquency rates, and also between surcharges for late payment and delinquency rates. These two potential pairs of variables have been plotted but no relationships are apparent from the available data. This agrees with information from Study B (page B-1), which suggests that low-income families know very little about discounts and surcharges. Very few heads of households interviewed could cite the amount of the discount offered by their utility for speedy payment of a bill or the amount of the surcharge they incur for late payment. Nor could they give appropriate dates. This is not to say, however, that surcharges and discounts do not affect the payment behavior of other categories of user. But the Study A data do not indicate this.

One feature of the billing system does not appear to affect the payment behavior of water and sewer service customers is the reconnection fee charged for resuming service. In Figures 13-15 reconnection fees have been plotted against cut-off rates for the three categories of utility. The relationship is most apparent in metropolitan utility service areas where

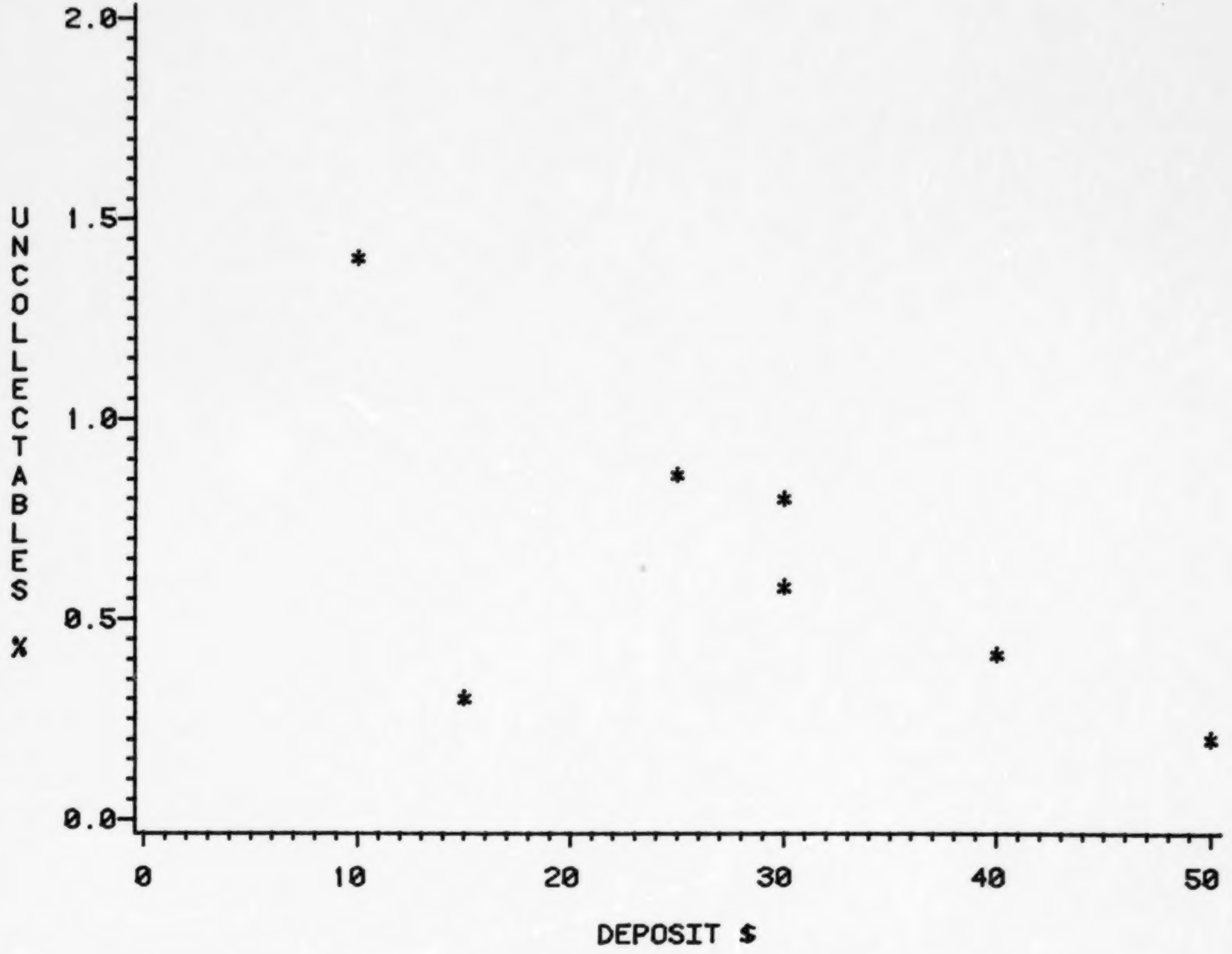

FIGURE 10 ANNUAL UNCOLLECTABLE SERVICE CHARGE DEBT VS. RECONNECTION FEE FOR RURAL AREAS

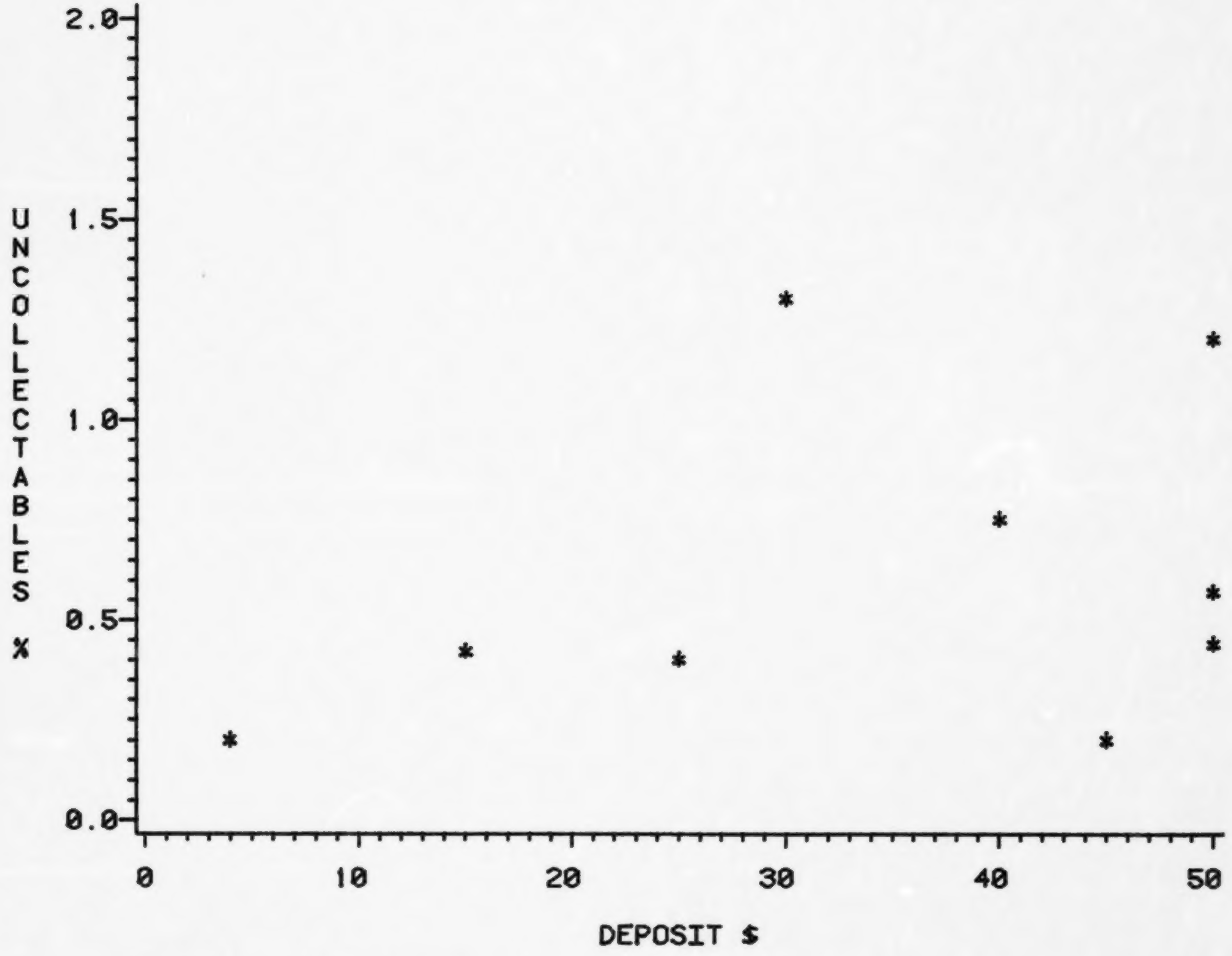

FIGURE 11 ANNUAL UNCOLLECTABLE SERVICE CHARGE DEBT VS. RECONNECTION FEE FOR NONMETROPOLITAN AREAS

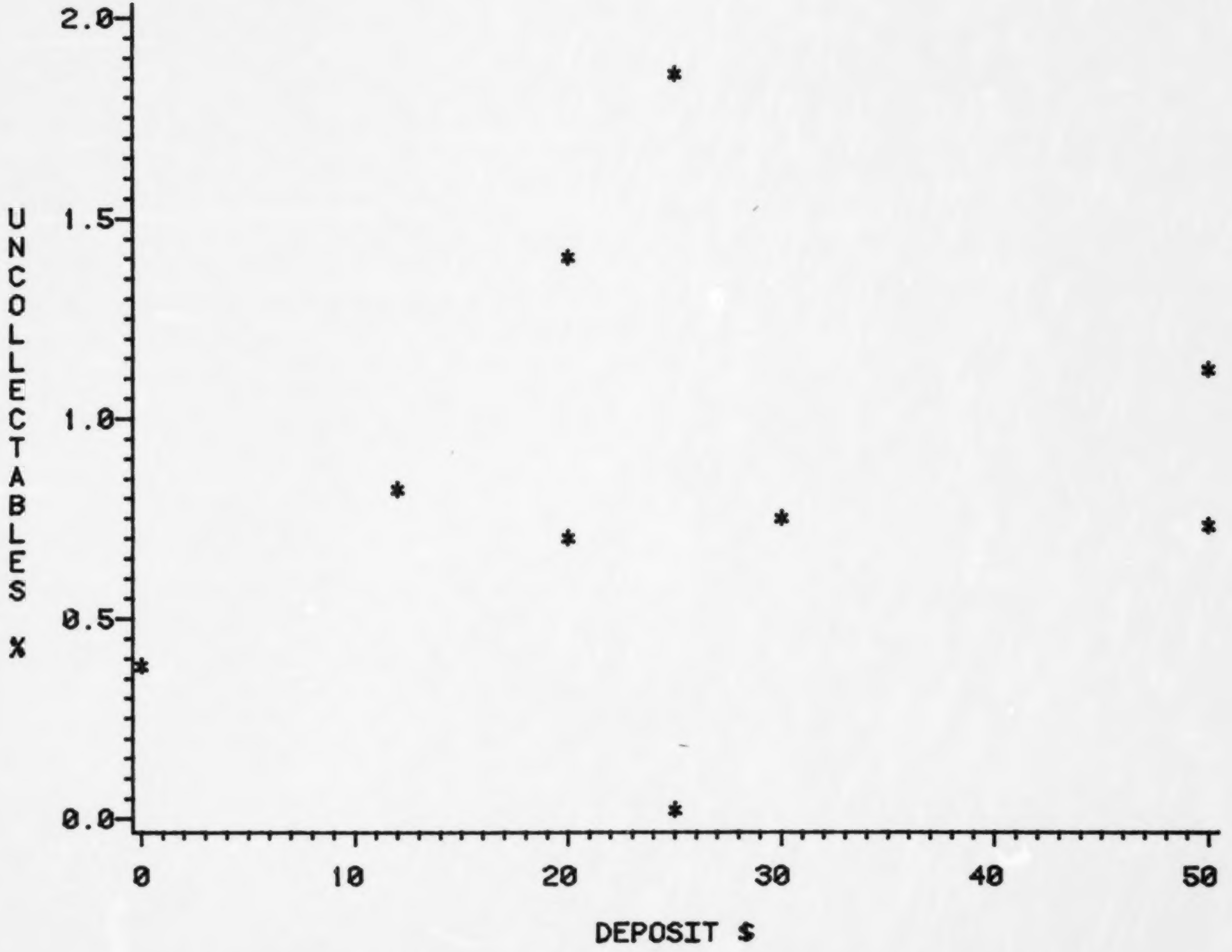

FIGURE 12 ANNUAL UNCOLLECTABLE SERVICE CHARGE DEBT VS. RECONNECTION FEE FOR METROPOLITAN AREAS

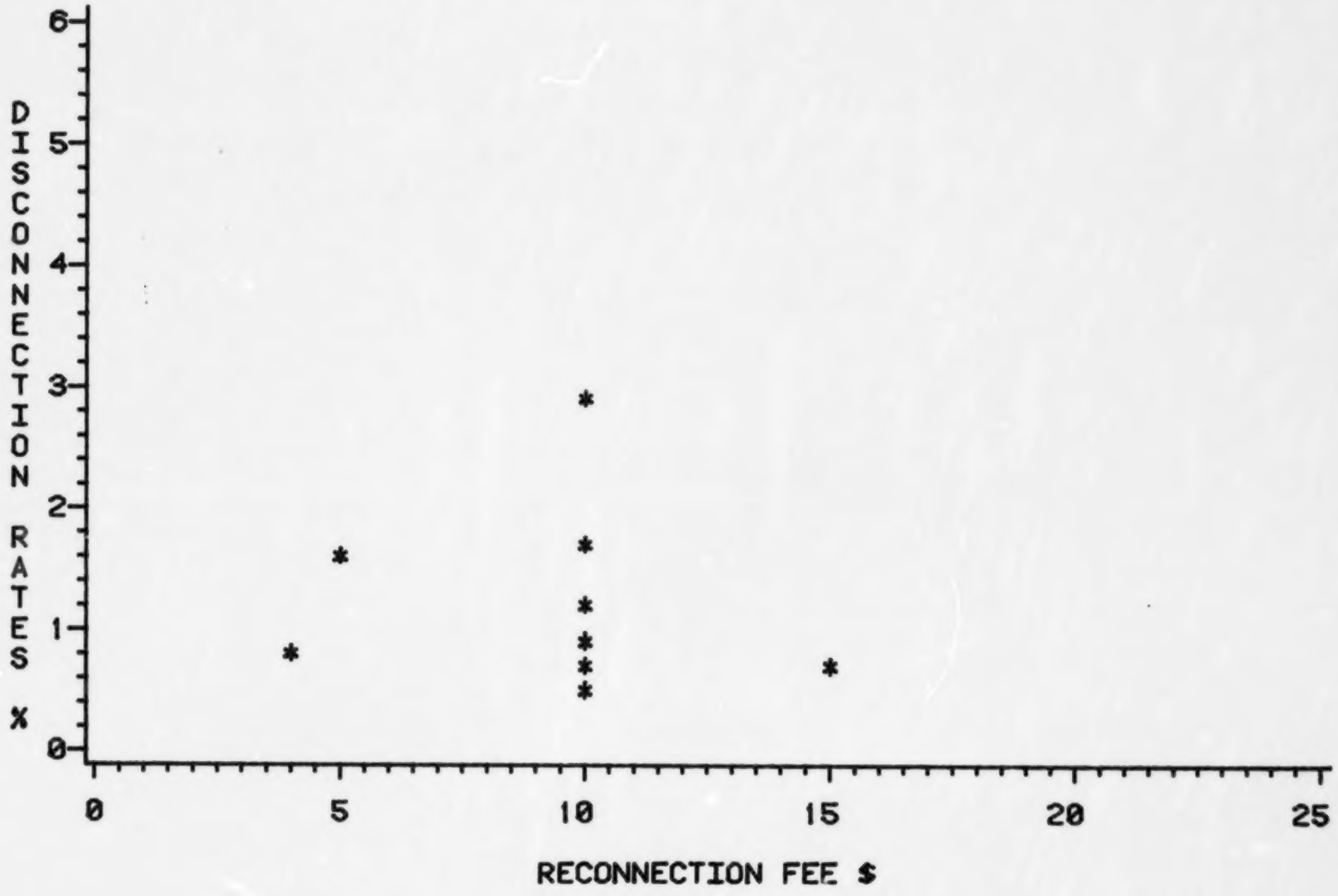

FIGURE 13 RECONNECTION FEE VS. DISCONNECTION RATES FOR RURAL AREAS

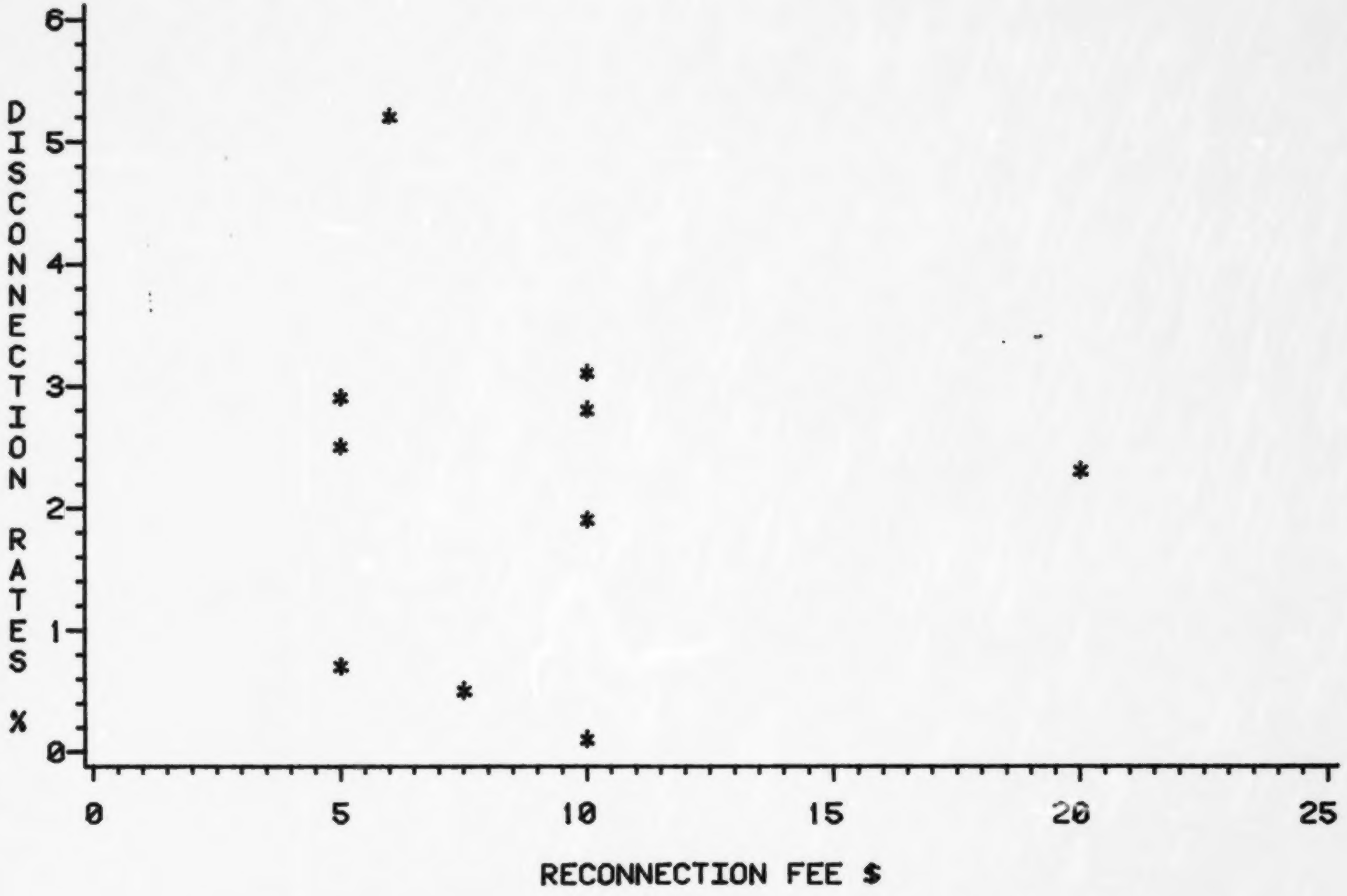

FIGURE 14 RECONNECTION FEE VS. DISCONNECTION RATES FOR NONMETROPOLITAN AREAS

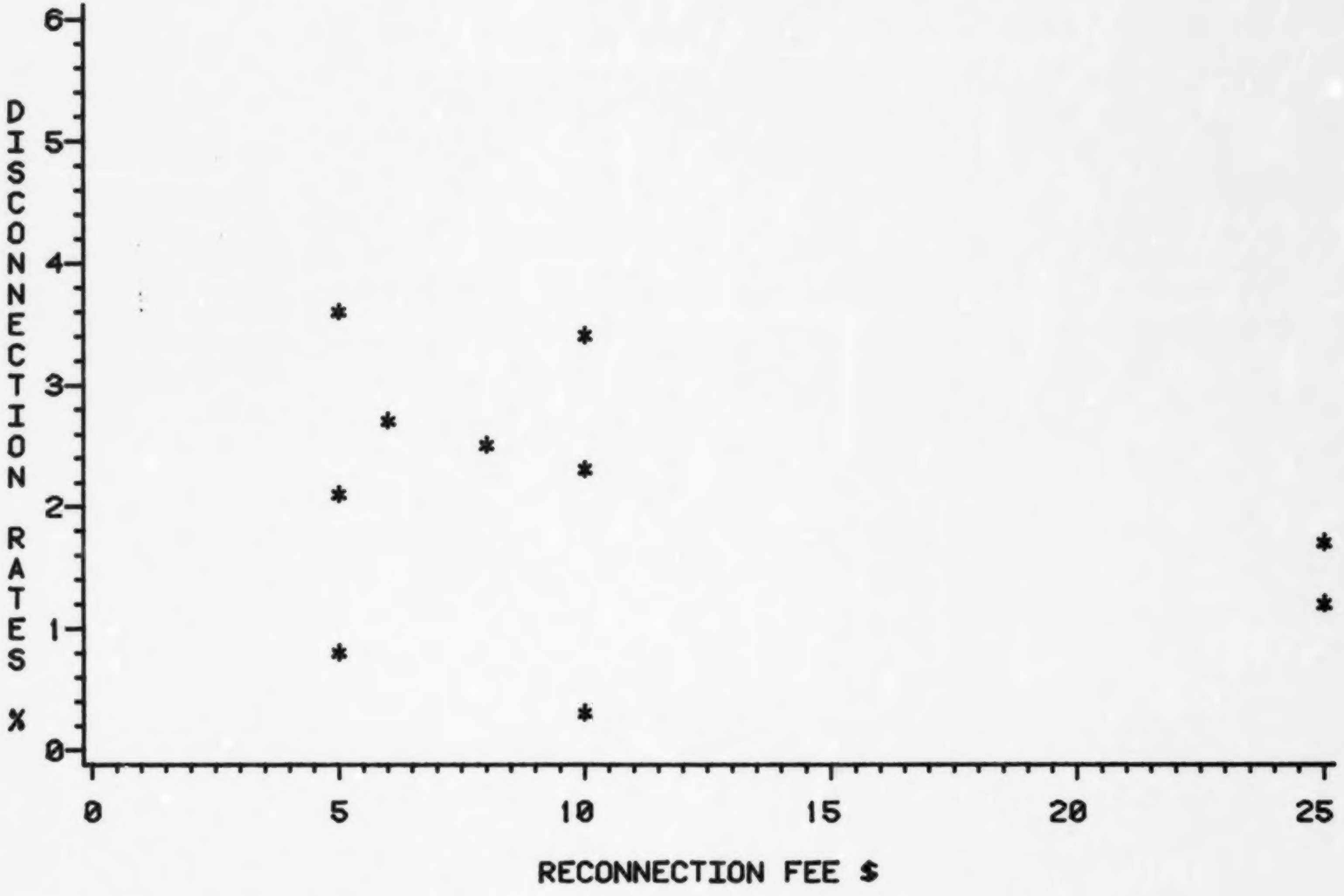

FIGURE 15 RECONNECTION FEE VS. DISCONNECTION RATES FOR METROPOLITAN AREAS

those utilities which levy small reconnection fees (of say $10 or less) generally have high cut-off rates, mostly above 2%. But the relationship is also observable for nonmetropolitan utilities. These results suggest that some low-income families may take into account the magnitude of the reconnection fee. A high reconnection fee may act as a positive stimulus to timely payment of bills. Or at any rate, in a utility service area where the reconnection fee is high (say $20 or $25) the low-income family head who is in arrears will go down to the billing office to attempt to negotiate a partial payment or a payment plan; in another service district with a $5 reconnection fee, the same family would be cut-off. Since, as will be documented in Section IV, the disconnection of water and sewer service to low-income families can, under some circumstances, create a public health hazard, it seems prudent that metropolitan and nonmetropolitan utilities establish adequate reconnection charges as part of their fee structure. This recommendation is reinforced by the fact that:

(1) Those utilities which charge less that a $20 reconnection fee do not recover the total cost of cutting-off and then reconnecting a customer.

(2) While a customer is disconnected, the utility is not accruing revenues through the sale of water and sewer services.

Of course, if reconnection fees are raised to a high level, some customers may not be able to reconnect within a short space of time. This would exacerbate the public health hazard: the issue is not simple.

Finally, in order to assess whether or not the length of the grace period permitted in a utility's billing system is a critical factor, a grace period ratio has been calculated for each utility. This is simply the ratio:

$$\frac{\text{length of grace period in days}}{\text{length of billing period in days}}$$

These values are given in Table 9, and plotted against disconnection rates in Figures 16-18. There does indeed appear to be a slight inverse relationship between grace period ratio and cut-off rates in rural and nonmetropolitan utilities which suggests that longer grace periods may allow families whose income is irregular or interrupted to maintain their payments. (This possibility has been referred to on page 61). However, this tentative result may not be significant since those utilities which have less strict, "relaxed" billing policies will tend to permit longer grace periods and will tend also to have low cut-off rates. Figure 16-18, therefore, may reflect the general billing policies of utilities rather than a causative relationship between grace period ratios and cut-offs.

THE USE OF LIENS AND COLLECTION AGENCIES

Many utilities use harsher methods of collecting customer debts then discontinuation of services. Table 10 records those utilities which use liens and collection agencies to recoup arrearages.

TABLE 9. BILLING SYSTEM DATA

	1	2	3	4	5	6
	Deposit	Reconnection Fee	Grace Period Ratio	Uncollectible	Delinquency Rate	Disconnection Rate
R1	$15	$15	3.2	- %	3.8%	0.7%
2	50	5	1.0	0.2	3.3	1.6
3	25	10	3.5	-	35.3	0.9
4	20	10	2.3	-	9.3	0.7
5	25	10	1.5	0.86	12.4	1.7
6	30	10	0.73	0.58	8.6	2.9
7	40	10	0.73	0.41	1.5	0.9
8	30	10	1.3	0.8	7.1	0.5
9	15	4	0.58	0.3	19.7	0.8
10	10	10	1.7	1.4	13.8	1.2
N1	15	5	1.1	0.42	9.7	2.9
2	50	20	1.1	1.2	14.8	2.3
3	50	6	1.1	0.44	14.5	5.2
4	25	10	2.2	-	-	0.1
5	25	10	0.33	0.4	3.0	1.9
6	50	10	1.0	0.57	9.2	3.1
7	30	7.50	1.4	1.3	2.1	0.5
8	3.96	10	0.88	0.2	2.1	2.8
9	45	5	1.5	0.2	8.0	0.7
10	40	50	1.2	0.75	10.6	2.5
M1	50	6	1.4	0.73	8.4	2.7
2	20	25	3.0	0.7	22.0	1.7
3	25	25	0.8	1.86	10.7	1.2
4	0	10	2.3	-	3.4	0.3
5	30	10	0.87	0.75	2.7	2.3
6	25	5	-	0.02	6.7	0.8
7	0	8	2.4	0.38	12.5	2.5
8	20	5	0.78	1.4	11.9	2.1
9	12	5	1.8	0.82	11.8	3.6
10	50	10	1.4	1.12	14.7	3.4

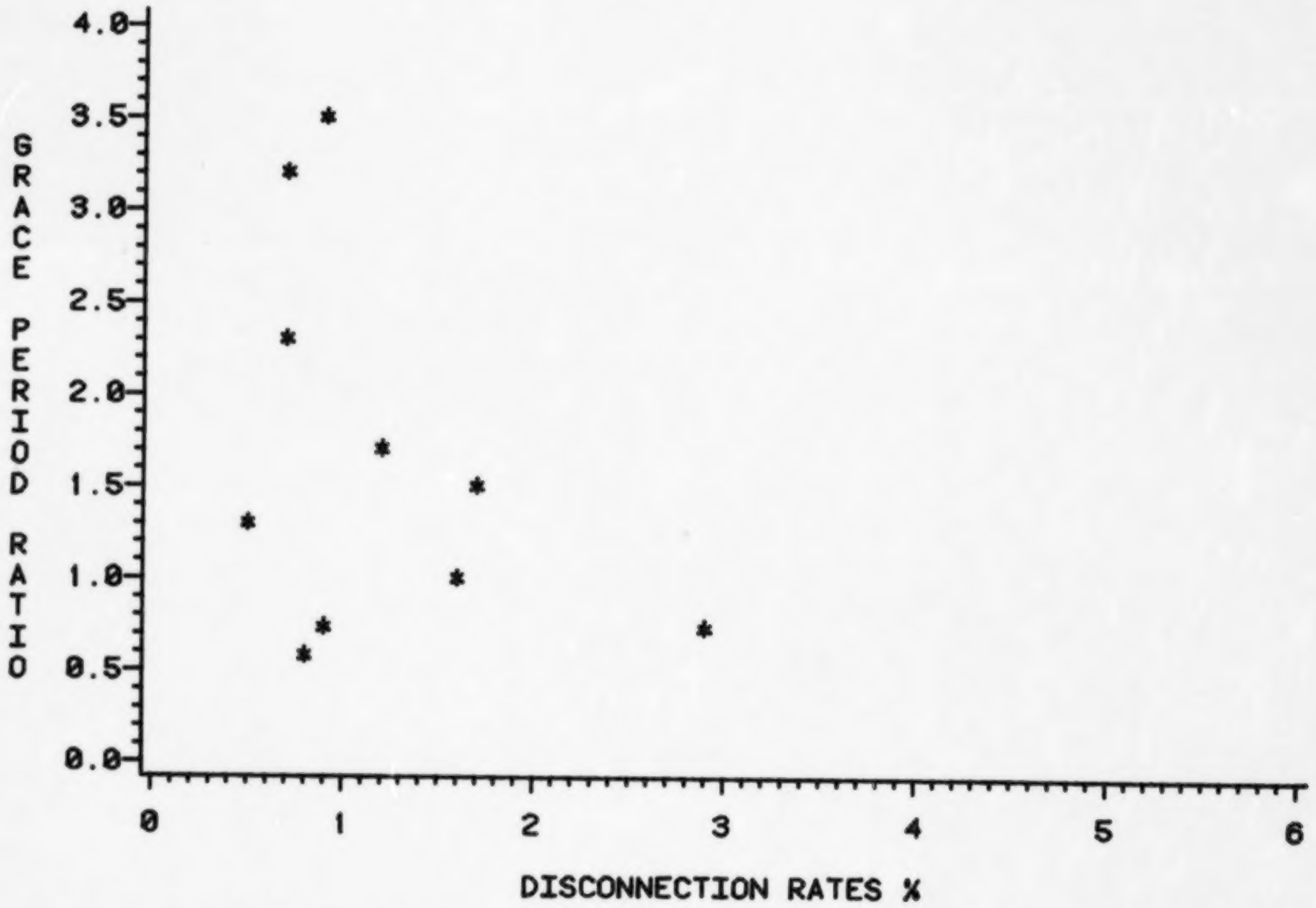

FIGURE 16 GRACE PERIOD RATIOS VS. DISCONNECTION RATES FOR RURAL AREAS

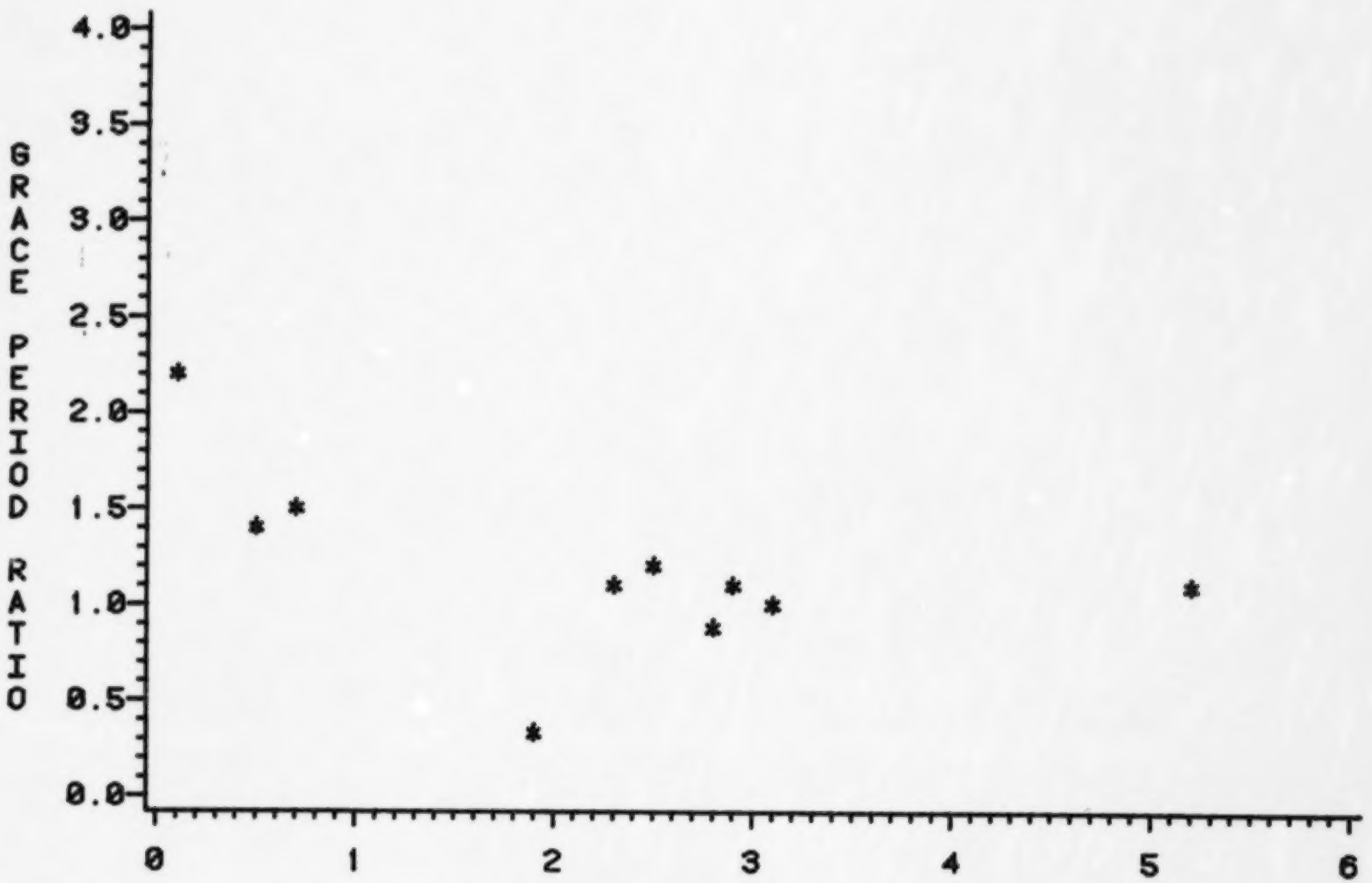

FIGURE 17 GRACE PERIOD RATIOS VS. DISCONNECTION RATES FOR NONMETROPOLITAN AREAS

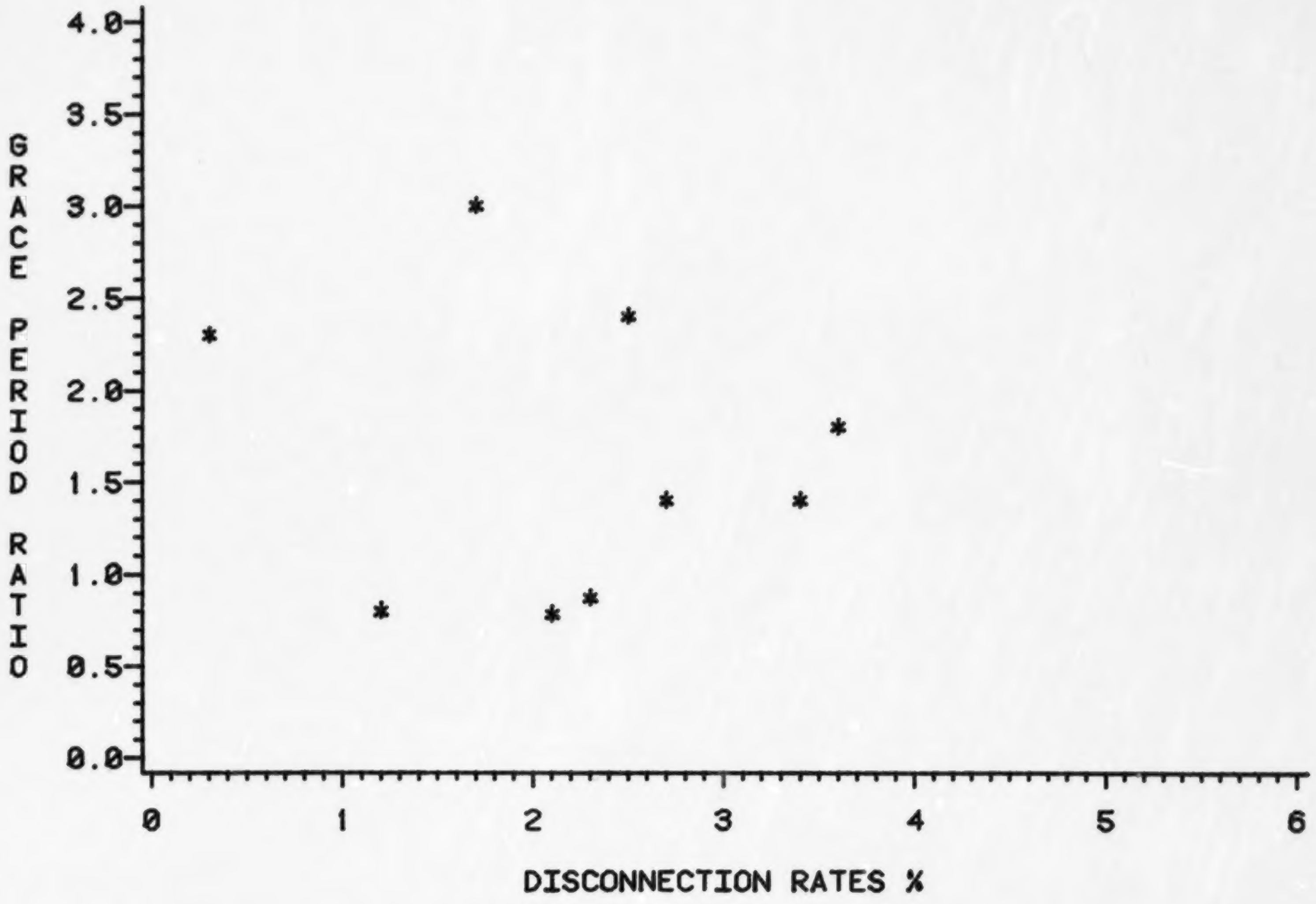

FIGURE 18 GRACE PERIOD RATIOS VS. DISCONNECTION RATES FOR METROPOLITAN AREAS

TABLE 10. USE OF LIENS AND COLLECTION AGENCIES

Utility Type	Liens	Collection Agencies
Rural	-	R9
Nonmetropolitan	-	N5, N9, N10
Metropolitan	M4, M6, M7, M8	M1, M3, M5, M7

As may be seen, metropolitan utilities use these techniques more than rural or nonmetropolitan ones; and collection agencies are more often used than liens.

Utility officials generally report that local Merchant's Associations, Credit Adjustment Bureaus, etc. are effective in recovering owed amounts; they are considered to be especially useful in collecting debts, through nationwide networks, from families which have left the area. There are, of course, some restraints placed on the use of these agencies. Some utilities will not take action until the debt is over 4 months old and exeeds a specified minimum amount typically between $75 and $200. And often the list of customers whose accounts are to be turned over to a credit agency must be approved by City Council. Despite these constraints, it seems doubtful that use of credit agencies by water and wastewater utilities is adviseable for the following reasons:

(1) the amount of debt collected by this method are generally quite small,

(2) if the utility required a sufficiently large deposit, say $50, and used it to absorb arrearages when families leave the area, many of these debts could be reduced to the point where they are insignificant,

(3) the collection agency takes as fee a substantial portion of the debt it collects, often 25%, 33% and in some cases 50%,
(4) the credit-ratings of many low-income families are affected, causing significant hardship,

(5) while it is appropriate for private companies to use collection agencies, most water and wastewater utilities are non-profit, local government entities, charged with the general obligation of serving the public good.

While utility officials consider collection agencies to be effective in collecting customer debts, they consider the use of liens to be far less so The principal difficulties they cite are:

(1) establishing a lien involves cooperation between several different departments of local government and is laborious,

(2) many customers are tenants, their landlords, residents in other states: landlords have no simple way of forcing delinquent tenants to pay,

(3) a lien is difficult to enforce: a sale of the property is necessary before the liens can be asserted. The utility usually has to depend upon the conveying attorney to inform them of the sale.

Only in one metropolitan utility, M6, are liens an effective means of collection. In the service area of this utility, an unusually tough lien law can be used against delinquent homeowners. The procedure is as follows: First a lien is placed on the delinquent property list and the homeowner warned by letter. In February of the next year, the property is advertised for sale in the local newspaper by the city tax collector. This is always sufficient to produce payment; no house has ever been actually sold. However, the percentage of uncollectible service charge revenues in this utility is extreme ly small (0.02%). This method of debt collection, though very efficient, cannot be recommended; and the state lien law on which it rests is being challenged in the courts.

PUBLIC HEALTH

Questions 11 and 12 (page A-8 of Questionnaire A) asked for information on whether utilities notified the Public Health Authority or any other local government authority when they disconnect a customer. Of the thirty utilities, twenty did not notify the public health authorities, seven did so "sometimes" or "only in special cases", and only three did so regularly as a normal procedure. Significantly, of these three, two notified the public health authorities mainly to put pressure on the customer to pay his owed bill; and in one of these two instances the Public Health Authority does in fact subsequently evict some delinquent customers. In only one of the three notifying utilities was the notification done promptly at the time of cut-off; in one case it was done ten days after cut-off, and in the other, two months after. In the seven utilities which notify "sometimes" or in "special cases" three indicated that they notified mainly in cases where a public health hazard was perceived to exist. One may summarize by stating that out of the thirty utilities studied only four notify the public health authorities regularly or occasionally with the primary motive of preventing or removing a public health hazard. Thus, it is fair to say that most utilities in the sample, at least in so far as their operating procedures were concerned, had a low sensitivity to community public health significant.[33] In fact, the amount of unused water or sewerage treatment capacity was considered to be an important factor by only seven of the thirty utilities. Thus,, it seems reasonable to imply, officials in the great majority of utilities considered themselves to have an adequate reserve of treatment capacity.[34]

Despite this, a large number of households who want water and wastewater service go unserved. In most service areas, householders living within 200 feet of a water or sewer line must, under either state law or local government ordinance, tap-in.[35] These ordinances are generally enforced by utilities--thus only in five utilities were there potential customers living within 200 ft. of a water or sewer line, but not hooked up.[36]

Outside this outreach distance most utilities are aware of potential customers who want to tap-in but who cannot. Question 6 asked:

> "Do you personally know of families who live at some considerable distance from a line, who would like to tap-in, but cannot because either (1) the utility has determined that the line cannot be extended at this time or (2) the families feel unable to meet the estimated costs of the hook-up? If the answer is yes, approximately how many families?
>
> Case (1) ______
>
> Case (2) ______

The responses of utility officials are summarized in Table 11.

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[33] i.e. whether or not the neighborhood was expected to grow; or whether the proposed line extension to the neighborhood would provide access to other growth areas.

[34] Of course, this is necessarily a subjective judgment. Many local governments wish to keep a substantial reserve or treatment capacity to attract new industries. What is perceived to be an adequate reserve capacity will vary depending on local conditions and individual opinion.

[35] The actual distance varies somewhat; 250 ft. is a common outreach distance. In one rural utility, which has an inadequate revenue base, a 500 ft. out-reach distance hs been set in order to force more tap-ins.

[36] Although only five utilities have unserved potential customers within the outreach area, the numbers involved are not small in two utilities: "several hundred" in one, and 50 and 100 in the other.

TABLE 11. ESTIMATES OF POTENTIAL CUSTOMERS

Utility Type	Case (1) average estimate of potential customers (# of utilities making charges	Case (2) average estimate of potential customers (# of utilties making estimate
Rural	16 (5)	13 (2)
Nonmetropolitan	24 (6)	58 (5)
Metropolitan	280 (4)	525 (2)

Thus, in summary, there exists in many of the service areas under study both a reserve of treatment capacity and a body of unserved potential customers.

No doubt this is in part due to the high costs of hooking up to the water and sewerage systems in many service areas. Utilities charge for hook-up in several ways. First, tap-in fees are always charged. These can vary from as little as $100 each for water and sewer tap-in to as high as a combined water and sewer tap-in cost of $665 in one metropolitan service area. In addition, impact connection fees are sometimes required; the highest encountered in this study being $792 for water and sewer. Some utilities in addition to the usual tap-in fee charge a front foot assessment fee: the highest among the thirty utilities being one nonmetropolitan utility which charges $6 per fron foot for water hook-up, and $6 for sewer. Thus, the assessment for a lot with a 100 ft. street abuttment is $1200.[37] Finally, there are other, lesser costs of tapping-in such as the plumbing costs and a charge for the meter. It can be observed from the above that total hook-up costs can be high, sufficiently so as to deter or prevent families from adding to utility service systems.

One useful technique three utilities have introduced as part of their line-extension policies is to place a moratorium on all or part of the total hook-up costs. In one utility this is done whenever a line is extended into an area where septic tanks are still in use: the goal being to encourage families to tap into the wastewater system; but it is also used to encourage the abandonment of wells in rural areas.[38] The chief advantages of a moratorium pointed to by utility officials are:[39]

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[37] Significantly, this utility frequently enforces hook-up of families within a 200 ft. outreach by means of court orders.

(1) enforcement of the 200 ft. hook-up requirement is often difficult and takes time. A moratorium ensures that customers will be added quickly and the revenue base thus expanded

(2) speedy hook-up of all families in a line-extension area benefits public health

(3) senior citizens and others on fixed incomes cannot afford hook-up costs

Other officials pointed to certain disadvantages:

(1) recovery of revenue through user-charges is very slow. But when a line is being extended the utility needs "upfront" funds, which often come from tap-in fees, etc.

(2) there is a question of equity:

  a. families which added to the system before the moratorium paid substantial hook-up fees.

  b. during a moratorium existing customers, who paid their own hook-up costs, are being burdened with the cost of tapping-in new customers. This only appears justifiable if the system carries a heavy debt-service.

  c. when the moratorium ends, the utility may experience public relations problems: potential new customers see no reason why they should pay.

Officials in three of the thirty utilities rather than introduce a moratorium, have developed systemsfor easy payment of tap-in fees. One utility allows senior citizens to pay tap-in fees in monthly installments over a twelve month period. Another levies a reduced tap-in charge, if the customer hooks-up within nine months of the line being extended to their property line.[40]

---

[38] Several utilities have the opposite type of extension policy: they make little effort to encourage tap-ins. In particular, one tap-in fee policy seems especially disadvantageous from the viewpoint of the community: it is the policy of settingno fixed tap-in fee, but simply charging a new customer the full cost of the hook-up, however much that might be. When this policy is in force, single residences or small groups of residences, often situated in low-lying areas or "hollows", often within the town limits, remain unserved with wastewater service because a lift station would be necessary for them to be added to the system. When applied within the town limits, this seemsan inequitable policy.

[39] Often it is only the tap-in fees which can be adjusted by the utility.

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[40] One financial arrangement which does not appear to have been explored but which answers most of the criticisms is:

a. the new customer pays reduced fee-say reduced by 25%--the amount of reduction being related to the debt service carried by the utility.
b. a fraction of this reduced fee, say one-third or one-half, is paid in cash (the proportion being tied to the utility's cash flow needs).
c. the remainder to be paid over twelve months at low interest.

Under this system, payment is made relatively easy, even for those on fixed incomes; yet the utility's cash flow needs, often necessary to continue work on the extension, can be satisfied. At the same time the equity and public relations requirements are at least partially met.

SECTION IV

A SURVEY OF LOW INCOME FAMILIES

INTRODUCTION

This section deals with primarily the low income families of the service areas of the thirty utilities studied under Study A. The main objective of the investigation was to consider the impact of utility charge structures, billing procedures, and debt collection techniques on low income families, and to prepare a socioeconomic profile of families likely to be adversely affected by user charge increases.

To attain the above objectives, the interview method of data collection was used. In an interview study, any of the three interacting variables can effect the outcome of the study. They are respondent, the interviewer, or the interview schedule (questionnaire). Hence in this study these variables were dealt with carefully.

During the first phase of the study an interview schedule was developed. A literature search indicated that no instrument was available which could be used in this study. The initial schedule included questions pertaining to the demographic characteristics of the family, their knowledge about various aspects of billing procedures, and their opinion on quality of water and on services provided by the utility company.

Pilot interviews were conducted in Denmark, Columbia and Barnwell areas using the initial schedule. As a result of these pilot interviews, the schedule was revised. We noticed that sequence of the questions asked was very important. Hence the schedule was restructured. Demographic and personal questions were asked first as they helped in establishing rapport with the respondents. Questions pertaining to knowledge and opinion were asked afterwards. This approach was very useful when students conducted the interviews. The interviewer (student) felt more comfortable with the respondent. Filter questions were used to exclude the respondent from the interview or from the particular question sequence if the questions were irrelevant to the respondent. For example, question #4: "Do You Receive Bills For Both Water and Sewage Services Directly From The ______________ (name of utility)?" was used to exclude the respondent from the interview if the answer to the question was "NO". Similarly, question #33: "Has Your Water Supply Even Been Disconnected?", if the answer to this question was "NO" the respondent was excluded from answering questions #34 to 37.

There were altogether 5 revisions of the initial schedule. The first revision was done after the pilot interviews were conducted. A second revision was necessary after the questionnaire for Study A was completed. During the pilot interviews of Study A, the utility officials made certain comments which led the researchers to expand some of the knowledge questions in Study B. The consultants to the project also made certain suggestions that led to the third revision of the schedule. It was further revised when students went to the field and experienced difficulty in getting answers to certain questions. It was necessary to restate certain questions, The final revision was made as a result of Study C. An attempt was made to revise scheule B to include questions which will obtain data to add to the study of price elasticity for consumers done under Study C.

During the second phase of Study B, students were carefully selected and were given necessary orientation to conduct the interviews. The requirements for selection of students were as follows: (1) the student must have enrolled at Voorhees College, (2) he/she had his/her major in social sciences, (3) he/she had completed Soc. 332: Research Methods and Soc. 338: Social Statistics courses, (4) he/she had satisfactory communication skills, and (5) he/she was willing to take added responsibilities. After the student was selected, they were given orientation on nature and purpose of the research project, and the importance of their role in the project. The students were also made aware of the possible problems which they might encounter during the interview. They were asked to answer the questions themselves and to be well versed with the questions. This was necessary as in an interview situation a respondent might ask classification of a question and the students would be expected to provde satisfactory clarification.

During the third phase of the study, attempts were made to locate low income families in each of the utilities studied under Study A. In order to locate families who had their water services disconnected, help was sought from human services offices and non-profit organizations. Most of these offices were very cooperative in locating low income families. However, it was difficult to locate families whose water had been disconnected through these sources.

As a series of questions in the schedule were devoted to this problem, serious efforts were made to locate families who had experienced the problem. We requested the utility offices to release a listing of families which were delinquent in paying bills, or had checkered histories of payment or have had their service disconnected. But the utility officers were generally reluctant to honor such requests. Some utility officials were cooperative in supplying locations of neighborhoods where the deliquency rate was high, and this proved very useful. Thereafter the students were sent into these neighborhoods.

In all instances, only those families who were willing to answer questions were interviewed. Families were asked if they received bills for both water and sewage services directly from the utilities in whose service area they lived. Only those families who answered "yes" to the question were interviewed further. For those families who answered "no" the interview was terminated after this question. The reason for doing so was that

The data in the present study were not representative of the total population, hence no attempts were made to generalize the results to the total population. Similarly, no sophisticated statistical tests had been applied to establish relationship between variables. The study was specially designed for lower-income families, hence social class was constant. A majority of families interviewed were black families, hence race was also considered constant.

A brief analysis of the data is given below and an attempt is made to draw conclusions and to suggest directions for future research. The implications of the study for policy makers are also stated along with the conclusions.

An average length of time that families had been utility customers was found to be 19.7 years. This is an important factor, as will be discussed later in predicting deliquency rate. This somewhat long period is indicative of the lower out migration rate among black lower class families of the south, as stated in migration literature.

The average number of persons living in a household was 4.9 persons. The number of persons in a family has impact on the size of the water bill. This large family was likely due to higher fertility rate among rural blacks or due to the fact that rural south blacks had vertically extended families. Vertically extended families were those where members of more than one generation lived together in the same household. In the south it was common for unwed mothers (and her children) to live with her mother, thus having three generations living together. In some instances the unwed mother wasa likely to move away to further her education or to work and leave her children with their grandmother.

The date on occupation could not be considered reliable. Firstly, a close scrutiny of the data suggested that because interviews were conducted mostly during the day, a majority of the respondents were women and they gave their occupation (housewife) instead of giving the occupation of the head of the household. Secondly, occupation was a sensitive issue for most lower income families who were receiving some kind of federal assistance. There was a natural hesitation on the part of the respondent to admit this to a stranger who came knocking at their door. The social desirability factor, as discussed earlier, was effective in this case. However, most women respondents indicated that they were housewives, teacher's aides, or worked on variable shift jobs. Interestingly enough none of the respondents admitted that they were receiving any kind of government assistance other than pensions.

Approximately 67 percent of the families interviewed had annual incomes of less that $3,000. Another 26 percent had annual incomes between $3,000 and $6,000, and the remaining 7 percent had annual incomes more than $6,000. This again is related with a typical phenomenon among lower class families. If the person is on any type of government assistance or had checkered history of employment, the person was unable to estimate his/her annual income and, when in doubt, was most likely to under estimate it than to over estimate and probably run the risk of losing financial assistance if the information was to become public.

About 40 percent of the families interviewed said they were dissatisfied with the services provided by the utility. The dissatisfaction was higher for families with incomes below the poverty line. When asked of the reasons for dissatisfaction, invariably the answer was that the bill was too high, although a few stated dissatisfaction with the quality of water supply. They further expounded that color of water was not clear and there were sediments in water. This, they indicated, was reported to the utility officials but the response of the utility officials were not satisfactory to the family. Poor quality of water was more a concern in metropolitan areas than in rural areas.

Most of the families interviewed were billed monthly. There were some with bimonthly or quarterly billing, but the numbers were not large. When asked of the preference, most indicataed preference for monthly billing as it facilitated paying bills regularly and the bills were smaller.

The total amount of the bill varied from family to family and from season to season. However, the average reported amount of a bill was $12.50 monthly. This information may not be reliable as most respondents did not remember the amount of their bills. When presssed for an answer they gave some approximate figures. The actual figures might be higher or lower than the ones given by the respondents.

Approximately 94 percent of the families interviewed said that they had no knowledge as to how their bills were calculated. The lack of knowledge about procedures for calculation of bills among low income families was not an unexpected finding. For families which did indicate having knowledge of bill calculations, their knowledge was limited to procedures like "they read over meter". This lack of awareness was likely to be related to the dissatisfaction with the water bill as indicated earlier. This was brought out by statements like "even though I did not use much water, my bill is high" or "they read my meter wrong", etc.

Approximately 95 percent of the families interviewed either did not pay the tap-in fee or could not remember how much it was. This could be due to numerous factors such as they had lived in the same household for a long period of time (15-20 years) and lost track of the tap-in fee or they did not keep a record of it, or they themselves did not pay the fees. It could have been paid by their parents, husbands, landlords or previous owners.

The average deposit paid by the families interviewed was $27.50. However, most families interviewed did not know if they could get back their deposits, and practically none of them were aware whether or not they would receive interest on it. This again relates to the lack of awareness on the part of the families about the operating procedures of the utilities.

Approximately 60 percent of the families interviewed indicated that there was a significant increase in their water and sewage bills in the past two years. However, none could recollect the exact time or extent of dollar amounts involved.

About 84 percent of the families indicated that they had not experienced any difficulty in paying their water bills. It could be due to social desirability factors affecting responses, since delinquency rates in many of the neighborhoods exceeded 50 percent.

Approximately 80 percent of the respondents claimed to have no knowledge that one could make a partial payment on their water bill, even though almost all utilities did allow partial payments as indicated in Study A. It is obviously not publicized, and as indicated in Study A, is done more or less on a case by case basis. Lower class families had tendencies to either pay the bill in full or not to pay it at all. They were uneasy in approaching the utility officials for any consideration of partial payment with the assumption that such request would probably be denied after all.

Most families (95 percent) did not know if their bills were prorated. When they were informed about prorating and asked to comment on the method to be used to calculate their water bills, most were uneasy about it. Some felt that it would be alright to prorate their bills if it evened out the bill, but if the bill was to be uneven they were not in favor of prorating. This was also indicative of general distrust towards establishments that lower class families often express. Few families indicated that prorating would be acceptable to them if it reduced the amount of the bill they received. It was interesting to note that residents of metropolitan utilities were more likely to favor prorating. These families were also slightly better off than the ones who were against prorating. Lack of knowledge about prorating could be a factor influencing their answer. Some long term residents mentioned that if by prorating, the utility would bill them equal amounts for 11 months in a year and would make adjustments once a year, then it would be more acceptable. They felt prorating may eliminate their problem of receiving unusually higher bills seasonally.

None of the families knew of any discount they might receive for paying their bills promptly. Study A indicates that some utilities did pay 5 or 10 percent discount if a bill is paid quickly. Ironically, the lower class families who could benefit the most from such rewards were unaware of the practice.

About 47 percent of the families, however, indicated that they knew about the penalty they had to pay if they were late in paying bills. It can be speculated some of these 47 percent have experienced penalties for late payment sometime or another. This figure coincided with utility officials estimates of 50 percent delinquency rates in the areas of study. However, it could not be established as a fact as they were only asked about their knowledge about penalty and not about their experience with late payments.

In response to the question assessing their knowledge about cut off and reconnection procedures, only 31 percent of the respondents indicated that they were aware of the procedures. However, only 2 percent of the respondents admitted that their water was ever disconnected. Even though this coincides with the findings in Study A where the average cut off for

30 utilities was estimated to be 1.8 percent, it was difficult to asess if a negative response to the question was due to the social desirability factor as stated earlier.

Among the families who indicated experiencing cut off, the length of time for water to remain cut off varied from 24 hours to 6 weeks. The average was a week. This also coincides with the findings in Study A. The source of water supply during the cut off period was usually members of the family or neighbors. Water was transported in plastic bottles (empty milk containers) for cooking and drinking purposes and in metal containers for other uses. Drinking water was usually stored in refrigerators and other water at room temperature. The maximum length of time for water storage was around 48 hours. Bathing and toilet facilities in places other than families homes were used. Interestingly, almost everyone whose water was cut off for extended lengths of time had close relatives (usually mothers) living just a few blocks away.

It is difficult to estimate the extent of public health hazards based on the data collected from this study. However, it was evident that public health hazards existed everytime water and sewage facilities were cut off for extended periods of time. Most families reported bringing water in metal containers which were not covered and, on occasions, water was reportedly contaminated due to rust or other objects falling into the open storage buckets. Drinking water was also reported to be unclean and on occasion the milk sediments were not cleaned from the bottle properly. Children reportedly used outside open space for toilet facilities and walked on the ground with bare feet. In some instances toilets were not flushed properly and the odor filled the house.

A definite indication of public health hazards would have been a wide spread occurrence of worms or diarrhea among children or adults. However, it is difficult to establish the fact that the wide spread occurrence of worms or diarrhea in the south is due to water cut off. Even in cases where the public health hazard due to water cut off was suspected, it is difficult to prove as both events happened sometime in the past and the families could not recall a time gap between cut off and occurrence of illness. Hence, no definite relationship could be established between water supply cut off and public health hazards on the basis of the present data. However, further research in the area is recommended.

Although most interviews were conducted by students, as stated earlier, families which reported to have experienced cut off due to delinquency were visited by researchers. Data gathered during these visits were used to develop a profile of a family most likely to be cut off. The family which reported cut off was invariably a female headed family. The family head was relatively young and her source of income was uncertain. She had not been a customer of the present utility for any length of time. She had moved often and sometimes in the same neighborhood. In some instances where the family was headed by a male, the general characteristics were similar to that of the female headed family. It was difficult to interview a male head of the family during the day, as either he was not home or refused to be interviewed. Only those families who volunteered to be interviewed were interviewed for the study. Many utility officials agreed with the profile developed from the observation. Their agreement was however off the record.

Very few of the families interviewed knew of any agency which might assist, and were not sure if the agency would actually help in paying the bills. None of the families reported having received such assistance.

Most families were satisfied with the quality of water supply; however, in large metropolitan areas a few families complained of water quality. They reported that the color of the water was not clear, it was yellow, and that there were some unknown sediments in the water. Families who complained about the water quality said they boil and cool most of their drinking water. Water for other uses was kept in containers before use to allow sediments to settle in the bottom of the container. They had reportedly informed utility officials of the problem but were not satisfied with their response. Interesting, these families lived within city limits, usually a few blocks from the heart of the city.

During the later part of the study, an attempt was made to collect data to study water consumption patterns of families in different income categories. This was done by interviewing families from three census tracts of a metropolitan area. In track I, less than 5 percent of the families had incomes below the poverty line. In tract II, 5 - 15 percent of the families had incomes below the poverty line. In tract III, over 15 percent of the families had incomes below the poverty line. The selection of the families from each tract was made on the basis of their availability at the time of the interview. The respondents were asked six additional questions along with the questionnaire to ascertain their water consumption pattern.

Even though the results were not conclusive, they did suggest an interesting finding. According to this study, families in tract I and tract II were more likely to have a dishwasher, a washing machine, and a lawn or garden than families in tract III. However, families in tract II were likely to use their washing machine, dishwasher, or to wash the car, or water the garden or lawn more frequently than the families in tract I. This preliminary finding suggests that there is a difference in water consumption patterns of families at different income levels. A more detailed study is, however, needed to draw any definite conclusions.

Most water use studies are conducted from the utility officials point of view. Research done from the consumer's point of view is almost nonexistent. Secondly, most consumer studies use macrolevel data. A house to house consumer survey of water consumers, whether of high, middle or low income, had not yet been conducted according to available literature. The present study makes an attempt in this direction.

The main objectives of this study, as stated earlier, were to consider the impact of utility charge structures, billing procedures, and debt collection techniques on low income families and to prepare a socio-economic profile of families likely to be affected by user charge increases.

In the present study, an overwhelming number of families interviewed (85 percent) indicated that they had not experienced any hardship in paying water bills. This would indicate that the burden of water and sewage bills were not heavy even on low income families. However, the payment records of many utilities showed delinquency rates as high as 35.5 percent, and cut off rates as high as 5.2 percent. Thus the social desirability factor seemed to have influenced the response of the question.

In order to estimate the impact of utility charge structures for any specific group, their consumption patterns must be analyzed. As this was beyond the scope of this study, several data sources were studied. Most consumer surveys deal with a few broad categories of consumption such as houses, cars, and most recently, electric consumption. The only study applicable to the present research was done by Daniel Starch and Associates. The Starch study examined consumption patterns by income and other charateristics for a large number of consumption categories. Water and other sanitary services was one of the categories studied by Starch. The Starch study was done in 1969, however, they had given projections for 1985. These projections might not be accurate, but in absence of any other idea are worth consideration. According to the Starch study, in 1968 the lower income families spent about 0.4 percent of their consumable income on water and other sanitary services. In 1985, the study projected that this proportion was to reduce to 0.3 percent. Considering their projection was not accurate and the consumer has to spend much more on water now than when he did it in 1969, the proportion would still be low as compared to other consumption categories. Thus the findings of the present study that the water bill does not create any unbearable hardship support the Starch findings. The most common of this could be that as water is considered a necessity by everyone, water bills were generally paid even if the family is experiencing certain hardships.

There is a serendipity in the findings of the present study. During the course of interviews it was discovered that even though the overwhelming number of families were able to pay their bills, there were significant number of families living within the city limits (in some cases) or very close to the city limits (in most cases), who were unable to pay the tap-in fees and were thus unable to procure running water. Some of these families were lower income families who could not afford any other source of water except an open well. The utility officials do not consider them as their potential customers as these families were never connected to the city water source.

Further research in this matter suggests that this situation is wide spread in South Carolina. Most of these families were situated in rural areas, and even though they were feet away from the water lines they used an open well as their source of water. Some of these wells did not have concrete walls. During the rainy season surface water gets in the well and it was common for leaves to fall in the water and to rot. These families have no indoor running water or indoor toilet facilities. Some of these families do not even have an outhouse, and they use open space for toilet facilities. Their children were without shoes and they were likely to play in these open spaces. Public health officials were aware of these families.

Public health officials also were aware of these families' situation but were unable to do anything.

A second objective of the study was to examine the impact of billing procedures on the family budget of the low income families. The present study indicated that there was a lack of awareness among low income families about billing procedures. Except for receiving the bill and paying it as soon as possible, they knew very little about the bill. For example, few could answer the following questions: "How was the bill calculated"? "What were the minimum charges"? "Was the bill prorated"? "Was partial payment acceptable"? Very few families could answer these questions. There seems to be a need, based on this study, to increase public awareness about billing procedures. It would be imperative if the rates were likely to increase sharply due to large capital investments.

Findings from the present study indicate that a typical family which was likely to be delinquent in paying water and sewage bills and most likely to be disconnected, was likely to be young, urban, female head of the household, whose source of income was uncertain and who had not yet established her expense priorities. Age, urban residence, sex and absence of any fixed source of income seemed to be constant factors influencing the delinquency rate.

However, besides this typical model, there was an atypical model. In these cases it was more of a matter of dispute between the utility officials and the customer. In some of these cases, water bills had been unreasonably large due to leakage, due to the bursting of pipes or other connections. However, in these cases, in spite of delinquency, utility officials were likely to delay cut-off until the dispute was resolved.

According to some utility officials, who wish to remain unidentified, there were frequently middle class familes whose water bills were unusually large. These families also are likely to have difficulty in money management and were more likely to be delinquent. Cut-off rate was just as high in the middle class families as it was in lower class. However, the length of time water remained cut-off was slightly higher for lower class than it was for middle class. In spite of the widespread class bias that lower class families were more likely to be delinquent, according to utility officials, a large proportion of lower class families are most likely to pay their bills on time. During this study, we interviewed one eighty-four year old lady who was living on financial assistance from government agencies. She had no indoor plumbing or indoor water supply. Her source of water supply was a tap outside of her house. For her own convenience, she was bringing water to her door steps through a garden hose. She stored water in metal containers. When asked "if she had ever experienced difficulty in paying her water bills?" she smiled and proudly said "never, I always pay my bill, which is usually $4.00, in time." The myth that lower class families are less likely to pay bills continues to persist because a small proportion of lower class families were likely to be delinquent. However, the proportion of middle class families being delinquent was likely to be similar to that of the lower class.

As the water bill was usually a small part of the family budget, the reasons for not paying the bill for a lower class family could be not enough income and for a middle class family could be too many expenses. However, as the study was limited to the lower class families, no attempt has been made to compare the delinquency rate or cut-off rate of lower class families with that of middle class families.

SUMMARY OF SECTION IV

The socioeconomic profile of a lower class delinquent family stated above was based on the present study. All through the study a constant concern of the researchers was to find families who had actually been cut-off for interview purposes. It was not an easy task, for as one utility official put it, it was like searching for a needle in a haystack! Every conceivable effort was made to increase their number in the data. The larger the number of families that could be studied, the better was the possibility of understanding the nature of their problems. As previously indicated, in some instances it was difficult to ascertain if the respondent was stating the truth in response to the question. It was felt that unless a large number of customers who had experienced actual cut-offs were studied, it would be difficult to measure the complexities of the problem.

A profile of families most likely to be affected by user charge increases was difficult to develop based on this study. Most (98 percent) of the families were able to pay their bills and there was no evidence to suggest that any increase in user charges would force them to discontinue the use of public water supply. Without knowing the extent of increases, it was difficult to make predictions about customer reaction to the situation. Future research into the problem of families who are unable to tap into the public water supply seems to be a worthwhile project.

SECTION V

INTRODUCTION

This Section reports the final results of Study C for "A Study of the Impact of Water and Waste Water Utility Revenue Structures, Billing Procedures, and Debt Collection Practices on Low Income Families." The objective of Study C is to provide empirical evidence on the relationship between increases in user-charges for water/sewer services, delinquency rates and cut-offs. Special concern is given to low income consumers. The section is divided into four subsections. First, Subsection 2 examines the degree of correlation existing between fee increases and delinquencies/cut-offs for three separate utility areas. Following this, Subsection 3 uses monthly data for individual accounts in one utility area to provide a more intensive investigation of the above relationships plus some evidence on the differential impacts of price changes on low income consumers. Subsection 4 addresses the issue of measuring the "burden" of rate increases on low income consumers. A methodology for such a measurement is outlined and some empirical estimates utilizing the individual account data are presented. Finally, Subsection 5 contains a summary of the results and outlines the implications for policy makers.

FEE INCREASES, DELINQUENCIES AND CUT-OFFS: EVIDENCE FROM THREE UTILITY AREAS

As indicated above, the first task is to provide some initial evidence of whether or not increases in user-charges influence delinquencies and cut-off rates. This will be done using monthly data for three service areas. After a rather extensive search, these areas were identified as having had fee increases plus available time series data on delinquencies and/or cut-offs for a period before and after the fee increase. This search also indicated the very small number of service areas which actually maintain any sort of historical data on account delinquencies and cut-offs. Even the data for the three areas reported below are not ideal.

The service areas for which data were collected are Marion and Sumter, South Carolina and Augusta, Georgia. These areas cover the spectrum of service area sizes, ranging from Marion with a 1980 population of less than 8,000 to Augusta, a SMSA with over 250,000 inhabitants.

Marion, South Carolina

On July 1, 1981, Marion had an increase in the minimum charges for both water and sewer service ($4.50 to $5.50 for water and $3.50 to $3.85 for sewer). These minimums were for consumption of 2,500 gallons of water or less. The "marginal rates" for consumption levels over 2,500 gallons did not change ($.80 per 1,000 for water and .85% of the water bill for sewer service). Thus, while customers found the "average price" of water service increasing, the "marginal price" for those consuming above the minimum did not change (marginal meaning the price paid for each additional thousand gallons). Assuming most households consume above the minimum amount it will later be argued that the appropriate price variable is the "marginal price" or $.80 for Marion. However, since this fee did not change, we are forced to use a less appropriate average price measure which did change. In this average price (AP) will simply be the water and sewer bill paid by a residential customer who consumed 7,500 gallons of water per month.[1] Table 12 then shows the relevant information on delinquencies and cut-offs for Marion over the 1981 period. As indicated, starting July 1 residents found the average price of service had increased.[2]

The last two columns in Table 12 show the percent of accounts delinquent and percent of accounts actually cut-off. Looking first at delinquencies, if anything the percent of accounts with unpaid balances actually declined after July. To a lesser degree, the same appears to be the case for cutoffs. Thus, Table 12 provides little evidence to support the hypotheses that increases in minimum water and sewer charges in July led to an increase in delinquency and cut-off rates.

To further test the hypothesis that increases in average price levels generate increased delinquency and cut-off rates, the following simple regressions were estimated using the data from Table 12.

$$\begin{aligned} \text{DELRATE} &= \underset{(2.41)}{.666^*} - \underset{(-2.12)}{.036}\ \text{AP} + \underset{(.70)}{.019}\ \text{SDUM} \qquad (1) \\ R^2 &= .34 \end{aligned}$$

$$\begin{aligned} \text{CUTRATE} &= \underset{(1.32)}{.086} - \underset{(-1.05)}{.004}\ \text{AP} - \underset{(-.11)}{.001}\ \text{SDUM} \qquad (2) \\ R^2 &= .15 \end{aligned}$$

where

DELRATE = percent of accounts deliquent

CUTRATE = percent of accounts cut-off

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[1] Such average price measures have been used in studies of demand for municipal water. See for example Wong (1972) and Foster and Beattie (1979). A discussion of the appropriate price variable is found in Section 3.

[2] Thus, prior to July 1, 1981, a consumption level of 7,500 gallons would cost $15.40, while after this date it would cost $16.75.

AP = average price ($15.40 prior to July, $16.75 thereafter)

SDUM = 1 for summer months, 0 for others.

t values are in parentheses and * indicates significance at the 5% level.

TABLE 12. MARION, SOUTH CAROLINA

Date (1981)	Number Customers	Delinquent Accounts	Cut-Offs	Percent Delinquent	Percent Cut-Offs
January	2,704	383	24	14.2	.9
February	2,695	241	40	8.9	1.5
March	2,678	252	103	9.4	3.8
April	2,673	307	48	11.5	1.8
May	2,723	215	62	7.9	2.3
June	2,721	290	30	10.7	1.1
July	2,734	250	51	9.1	1.9
August	2,736	58	35	2.1	1.3
September	2,625	67	30	2.6	1.1
October	2,750	155	41	5.6	1.1
November	2,784	82	42	2.9	1.5
December	2,782	297	60	10.7	2.2

As seen, the average price variable has the wrong sign to support the stated hypotheses but in neither case is its influence on the dependent variable different from zero. This is true even controlling for the expected influence of the summer lawn watering season on delinquencies and cut-offs by including a summer intercept dummy variable (SDUM).

To conclude, while the Marion data shows some dramatic changes in delinquencies and cut-offs (especially delinquencies), these variations do not seem to be associated with the average price change. One must conclude that there are other factors which contributed to these variations and the price increase effect, if it exists, was overpowered by these unknown events.

Sumter, South Carolina

The second service area with available aggregate monthly data was Sumter, South Carolina. This could be considered a middle-sized service area, with the town itself having a 1980 population of just under 25,000 individuals. The city increased its "marginal rate" or the amount charged per 1,000 gallons above 3,000 from \$.60 to \$.65 for in-city users and \$1.20 to \$1.30 for those outside the city.[3] This was done on January 1, 1982. Data on delinquencies and cut-offs, however, were available only through March of 1982 giving a very short time period during the higher fee period. On the other hand, the city bills in two cycles for which data were available. One, Cycle (A), is made up almost entirely of in-city accounts. The other, Cycle B, is approximately two-fifths in-city and three-fifths outside the city. Thus, when the monthly data for each of these two cycles are combined, we have two observations per month variations in marginal price coming from two sources: 1) the fee increases imposed on all users after January 1, 1982, and 2) whether or not the monthly observation is for Cycle (A) or Cycle (B).

Table 13 contains the relevant monthly data for both cycles over the April 1981 to April 1982 period. The values shown are defined as follows:

MP = [(percent of customers in city) x (total number of customers) x (marginal price for city) + (percent of customers outside city) x (total number of customers) x (marginal price for outside the city)] divided by total number of customers.

DELRATE = percent of account delinquent
CUTRATE = percent of accounts cut-off.

The only variable that needs discussion is MP. Here, MP is defined as a weighted average of in- and out-of-city rates, weighted by the percent of customers in each Cycle who reside in and out of the city. Thus, the calculated MP values for Cycle (B) are significantly greater than those for Cycle (A) since well over half the accounts in Cycle (B) are out-of-city.

In looking at Table 13, a couple of observations are possible. First, it does appear that on the average, delinquency rates over the period were greater for Cycle B with its higher marginal price (11.6% for Cycle A vs. 16.2% for Cycle B). To a lesser degree, the same is true for cut-off rates (3% average for A, 4.6% for B). Thus, it may be that the larger marginal price payed by these consumers is resulting in higher delinquency and cut-off rates. Secondly, it is not immediately apparent that delinquencies and cut-offs increased noticeably during the first three months of 1982 when the fee increase was put into effect. This observation holds for both cycles. Of course, three months is a short period of time on which to base a conclusion of no effect.

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[3] Rates were also increased for larger consumption blocks but the next level is 50 thousand gallons, well beyond average residential consumption levels.

TABLE 13. SUMTER, SOUTH CAROLINA

CYCLE A

Date	MP	Delrate	Cutrate
April 1, 1982	.702	.110	.025
March 1, 1982	.702	.091	.028
February 1, 1982	.715	.127	.025
December 31, 1981	.648	.117	.031
December 1, 1981	.648	.117	.205
October 29, 1981	.648	.105	.031
September 29, 1981	.648	.100	.025
August 28, 1981	.648	.120	.026
July 30, 1981	.648	.109	.032
June 29, 1981	.648	.098	.028
May 28, 1981	.648	.133	.039
April 29, 1981	.648	.165	.047

CYCLE B

Date	MP	DELRATE	CUTRATE
March 16,1982	1.099	.128	.032
February 16,1982	1.099	.156	.043
January 15, 1982	1.099	.156	.029
December 16, 1981	1.014	.134	.049
November 17, 1981	1.014	.169	.044
October 14, 1981	1.014	.151	.044
September 14, 1981	1.020	.147	.042
August 13, 1981	1.014	.176	.038
July 14, 1981	1.014	.167	.049
June 16, 1981	1.014	.154	.052
May 14, 1981	1.014	.191	.068
April 15, 1981	1.008	.216	.067

To provide a more precise test of the hypothesis that increases in marginal price lead to higher delinquencies and cut-offs, Table 14 shows the result of regressing DELRATE and CUTRATE on MP and SDUM. SDUM is the same zero-one summer dummy variable used for Marion. Three sets of estimates are made: 1) using all observations, Cycle A and Cycle B combined, 2) using only Cycle A; and 2) using only Cycle B. As can be seen, when both groups are combined, the coefficient of MP is positive and significantly different from zero in both the DELRATE and CUTRATE regressions. Thus, when considering variations in MP coming from both the fee increase and consumer location (in or out of the city), higher MP values are associated with greater delinquency and cut-off rates. When the estimates are made

TABLE 14. SUMTER, SOUTH CAROLINA REGRESSION RESULTS

I. All Observations:

$$\begin{array}{lllll} \text{DELRATE} = & .042\ + & .144\ \text{MP}^{*}\ + & .007\ \text{SDUM} & R^2 = .48 \\ & (1.81) & (+4.39) & (+.53) & \end{array}$$

$$\begin{array}{lllll} \text{CUTRATE} = & .006\ + & .038\ \text{MP}^{*}\ - & .001\ \text{SDUM} & R^2 = .34 \\ & (.62) & (3.29) & (-.21) & \end{array}$$

II. Cycle A only

$$\begin{array}{lllll} \text{DELRATE} = & .209\ - & .139\ \text{MP}\ - & .004\ \text{SDUM} & R^2 = .03 \\ & (1.25) & (-.55) & (-.24) & \end{array}$$

$$\begin{array}{lllll} \text{CUTRATE} = & .105\ - & .112\ \text{MP}\ - & .003\ \text{SDUM} & R^2 = .19 \\ & (2.02) & (-1.44) & (-.54) & \end{array}$$

III. Cycle B only

$$\begin{array}{lllll} \text{DELRATE} = & .425\ - & .256\ \text{MP}\ + & .004\ \text{SDUM} & R^2 = .18 \\ & (2.08) & (-1.30) & (.22) & \end{array}$$

$$\begin{array}{lllll} \text{CUTRATE} = & .269^{*}- & .214\ \text{MP}\ - & .009\ \text{SDUM} & R^2 = .46 \\ & (3.29) & (-2.72) & (.1.11) & \end{array}$$

NOTE: t values are in parentheses.
* significant at least at the 5% level

The above results for Sumter are somewhat more supportive of the hypothesis that higher water and sewer fees lead to greater delinquencies and cut-offs than we were able to find for Marion. While the post-fee increase period for this service area may be too short to allow the expected relationships to reveal themselves, the in and out-of-city variations do support the hypotheses being tested. Care must be taken, however, in the interpretation of this finding. That is, factors other than higher MP values may be leading to greater delinquency and cut-off rates found for Cycle B. There is some weak evidence that average incomes may actually be lower for consumers living outside the city's service area than for those living in the city.[4] Thus, the higher DELRATE and CUTRATE values may be reflecting the influence of lower income consumers and/or higher marginal prices. Further unspecified factors may also be contributing to the results found in Table 14.

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[4] Using 1970 census data, the median income for city households wer $7,071, while that for the county was $6,407.

Augusta, Georgia

The final area to be considered in this section is Augusta, Georgia. This metropolitan area was found to have time series data available over a period for which two fee increases were applied. Also, in a manner similar to Sumter, billing is done in separate cycles, with each cycle being a specific geographic area. Prior to July 1, 1979, in-city users paid $.55 per 100 cubic feet for the first consumption block beyond the minimum, while out-of-city customers paid $1.10. After July 1, the rates increased to $.61 and $1.22 respectively. Then, on March 1, 1980, a second fee increase was employed. In-city rates jumped to $.81 per 100 cubic feet while out-of-city rates went to $1.60.

The information available for Augusta over the period covering the fee increases pertains not to individual accounts but to entire billing cycles. For example, the utility maintains data on total monthly consumption, total amount due, total unpaid balances, total collections, etc. for each of the several billing cycles. Data on monthly cut-offs or number of residential customers was not maintained. The information available does, however, allow one to observe the relationship between fee increases and various measures of delinquencies over a period in which two fee increases were put into effect.

Since the Augusta data is available for eight cycles over a 22 month period (March 1979 to December 1980), it is possible to test the relationships of interest utilizing a data set of pooled cross section and time series observations (8 x 22 - 176 total observations). While monthly data on number of accounts, percent in city and percent residential is not available for the study period, the utility did have current figures for each cycle at the time this data was collected. This information is shown in Table 15. As can be seen, the cycles range from predominately city (e.g. Cycle 3) to predominately suburb (Cycle 6). Also, with the exception of Cycle 1, the majority of accounts are residential. Since our interest is with the influence of fee changes on delinquency and cut-off rates for residential water users, Cycle 1 will be excluded from the data set used to test these relationships.

TABLE 15. AUGUSTA, GEORGIA BILLING CYCLES--AUGUST 1982

Cycle	Number of Accounts	Percent in City	Percent Residential
1	2218	99.9	51.8
2	4288	14.7	86.8
3	2417	99.9	80.3
4	5141	34.0	90.9
5	2905	99.9	85.1
6	5946	8.1	93.1
7	3047	99.9	85.4
8	3012	97.9	92.1

Following the procedure established for the previous two service areas studied in this section, the desire is to regress a measure of marginal price and a dummy variable for summer months on a measure of delinquencies. Using two indicators of the extent of delinquencies, the following results are observed:

$$\begin{array}{llll} \text{UNPAID} = -4961.68^{*} & + 21087.69\ \text{MP}^{*} & + 701.98\ \text{SDUM} & R^2 = .70 \\ \qquad (-4.47) & \quad (18.57) & \quad (.91) & \end{array} \tag{5}$$

$$\begin{array}{llll} \text{RELDEL} = .487^{*} & - .183\ \text{MP}^{*} & - .030\ \text{SDUm} & R^2 = .16 \\ \qquad (14.08) & \quad (-.125) & & \end{array} \tag{6}$$

where

UNPAID = total dollar amount of unpaid balances being carried by all consumers in each cycle.

RELDEL = total unpaid balances divided by total amount of water consumed (in 100 cubic feet) in each cycle.

MP = [(percent of customers in city) x (marginal price for city)] + [(percent of customers outside city) x (marginal price for outside city)].

SDUM = 1 if summer month
0 otherwise

The results of (5) and (6) are somewhat conflicting. First, in the UNPAID regression, MP has the expected positive and significant coefficient indicating that higher marginal prices lead to greater delinquencies. However, when the dependent variable is weighted by the amount of consumption (RELDEL), the MP coefficient becomes negative and significant. The problem of course is that factors other than marginal price are contributing to variations in our measures of delinquencies (e.g. growing consumption over time leading to increased total unpaid balances).

To shed some light on the above, the same regressions were reestimated after including a variable to control for variations in city/non-city mix between cycles. The results of doing this are:

$$\begin{array}{lllll} \text{UNPAID} = & -1826.97 & + 15799.34\ \text{MP}^{*} & + 366.09\ \text{SDUM} & - 4694.59\ \text{PERSUB}^{*} \\ & (1.14) & \quad (6.96) & \quad (1.14) & \quad (2.67) \\ & R^2 = .71 & & & \end{array} \tag{7}$$

$$\begin{array}{lllll} \text{RELDEL} = & .297^{*} & + .137\ \text{MP}^{*} & - .040\ \text{SDUM} & - .284\ \text{PERSUB}^{*} \\ & (6.40) & (2.08) & (-1.81) & (-5.57) \\ & R^2 = .30 & & & \end{array} \tag{8}$$

where

PERSUB = percent of cycle's accounts which are not in the city.

In comparing (5) and (6) with (7) and (8) with (4), the most interesting observation is with the MP coefficient in the RELDEL regression. As is observed, when PERSUB is included in the regression, the marginal price coefficient becomes positive and significantly different from zero, while PERSUB has a negative and significant influence on RELDEL. Thus, suburban cycles which pay higher water fees are also observed to have lower delinquencies per 100 cubic feet of water consumed. Once this is controlled for, marginal price takes on the expected sign. Undoubtedly the reason for the lower RELDEL in suburban cycles is the higher incomes one finds there.[5]

The above results for Augusta are the most supportive to this point of the hypothesis that higher user fees for sewer and water service result in greater delinquencies. The pooled/cross section of nature of the data provides more observations and larger degrees of freedom than was possible for the other service areas. Also, the Augusta data covers a period where there were two increases in marginal price. Finally, the inclusion of PERSUB in the above regressions allowed us to at least indirectly control for the influence of different incomes on delinquency levels. These advantages inherent in the Augusta data have made it possible to more precisely isolate the influence of price changes on measure of delinquencies.[6]

FEE INCREASES, DELINQUENCIES AND INCOME: EVIDENCE USING INDIVIDUAL ACCOUNT DATA

The previous subsection relied on aggregated data for entire areas (or parts of service areas) to examine the relationship between fee changes and delinquencies. In this section, individual account data for a single service area is utilized to provide a more detailed and precise analysis of the relationship between these variables. We will begin by describing the data set to be used for the rest of this study. Next, the issue of the appropriate price variable is discussed. Finally, the empirical results are presented.

The Data

Monthly individual account data was provided by the City of Columbia, South Carolina, for its service area and covers the July 1980 to June 1981 period. This data included the account code, monthly water consumption (100 cf), water charge, sewer charge, total amount due and account address.

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[5] Since the service areas for the utility do not match any predefined census areas, it is not possible to compare the economic characteristics of the households in these areas. 1970 Census data does show, however, that mean 1979 family income for the City of Augusta was $6,205, while mean income for the urban balance of the SMSA was $10,258.

[6] Using the RELDEL (8) results to simulate the effect of a fee increase shows that a hypothetical $.20 increase n the man MP will result in RELDEL (delinquencies per 100 cubic feet of consumption) increasing from $.32 to $.34.

Only residential accounts were retained for this study and the utility was not willing to provide cut-off data. Utilizing the street address, it was possible to identify the Census Tract in which any particular account resided. Thus, information on income, poverty status and housing characteristics of the "neighborhood" for each account could be found in the Census Tract data. This information was merged with the water data. After deleting those observations with missing values for the amount of water monthly data for approximately 19,000 individual accounts spread geographically over 47 census tracts of the Columbia SMSA (Standard Metropolitan Statistical Area).

Price Variable

Before proceeding with the empirical work, it is necessary to address the issue of selecting the appropriate price variable. In Section 2 we simply assumed that an ex ante measure of marginal price was most appropriate. This price variable will also be used for the rest of the study and its use must be justified.

The first issue is whether price should be determined ex post (after the consumption level has been established) or ex ante (a predetermined price; e.g., that paid by the "average" consumer). An example of the former would be an average price calculated by dividing a consumers total bill by his quantity consumed. The problem with this is the simultaneity it could introduce. With declining block rates, average price declines as the quantity consumed increases. Consumer theory of course assumes that price increases will cause decreased consumption. The ex post specification could lead to empirical problems in that the regression results may reflect the effect of quantity on price rather than price on quantity.[7] For this reason, an ex ante price variable will be used.

A second point is whether to use ex ante average price (AP) or ex ante marginal price (MP). Economic theory states that consumption is determined primarily by marginal price [see Gibbs (1968) and Howe and Linaweaver (1967)]. On the otherhand, Wilder and Willenborg (1975) argue for using average price based on the assumption that additional use (or conservation) is a reaction to total bill changes and that consumers do not know the marginal block rates anyway.

The choice between MP and AP for this study will be based on empirical evidence. First, using the above data set, the following regression estimates were made:

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[7] A good presentation of this argument can be found in Helms and Vallery (1980, pp. 12-15).

$$Q = 13.88^{*} - 3.11\ MP^{*} + .003\ W^{*} \qquad R^2 = .0037 \qquad (9)$$
$$\quad (153.10)\ (-24.78) \quad (3.51)$$

$$Q = 13.05^{*} - 1.63\ AP^{*} + .005W^{*} \qquad R^2 = .0013 \qquad (10)$$
$$\quad (130.00)\ (-13.60) \quad (4.89)$$

where

Q = quanity of water consumed (100 cf).

MP = fee per 100 cf for the first consumption block.

AP = water bill for the mean consumer (calculated at the mean consumption level for the entire data set) divided by the mean consumption level.

W = average monthly maximum temperature divided by average monthly precipitation if the month is a summer month

0 otherwise

t values are in parentheses and * indicates significant at least at the 5% level.

Before discussing these results, a few points concerning the data set and variables needed to be considered. First, the data set was modified by removing those observations with consumption values (Q) of either less than than 300 cf or more than 10,000 cf. The reason for this is that in looking for the first consumption block.[8] The mean Q was 1184 cf per month with a standard deviation of 927 cf. Thus a vast majority of consumers are well within the first consumption block (i.e., one needs to consume over 10,000 cf per month to move to the next fee block). To be consistent with this definition of MP, observations falling outside the first fee block were deleted. Second, AP is nothing more than the water bill for the "average" consumer in the adjusted data set divided by the "average" monthly consumption. This is considered an *ex ante* definition of average price (see Helms and Vallery 1980, p. 151). Finally, W is a weather variable and similar to the SDUM (summer dummy) variable used in the previous section. The intent here is to control for the expected increase in demand during the summer months for lawn watering. As defined, W incorporates information on maximum temperatures *and* average precipitation, both of which influence the demand for water for this purpose.[9]

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[8] The rate schedules for the time period covered by the data are shown in Appendix A. As can be seen, an increase in water fees for both in-city and out-of-city residents occurred on January 1, 1981.

[9] Source for this information was the National Weather Service, Columbia Station.

Now, lets turn to the results of the estimations shown in (9) and (10). The only difference in these two regressions is the price variable (AP and MP). In both cases, the effect of price on Q (consumption) is negative and significantly different from zero. However, the regression equation with the marginal price variable has an R^2 value nearly three times that found for the equation with average price. Also, the simple correlation coefficient betwen MP and Q is -.06, while that between AP and Q is -.03. Thus, for this data set, MP or the per 100 cf fee for the first consumption block appears to be the preferable price variable.

The Empirical Evidence

With the choice made as to the proper price variable, we can now turn to our major concern. That is, whether or not increases in MP result in greater delinquency rates and if such increases have a differential impact on accounts in low income areas. To begin to examine these questions, the following regression equation was estimated:

$$\underset{}{DELQ} = \underset{(56.94)}{.594^*} + \underset{(28.27)}{.309\ MP^*} - \underset{(-48.45)}{.0002\ INC^*} + \underset{(3.94)}{.003\ W^*} \qquad (11)$$

$$R^2 = .016$$

t values are in parentheses and * significant at least at the 5% level.

Here, DELQ is the amount over due any month divided by the current water and sewer charge for that months consumption of services. The delinquency variable thus measures the "relative" delinquency of an account and is a continuous rather than a dichotomous (delinquent/non-delinquent) variable. INC is the man 1980 family income for the Census Tract in which the amount is located. MP and W are as previously defined.

There are two major conclusions to be drawn from the results of (11). First, the positive and highly significant coefficient found for MP supports the hypothesis that higher service fees (MP) result in greater delinquences. This holds true even when one control for the influence of income variations of delinquency rates (i.e., with the INC variable included in the regression). Second, the negative and significant value for the INC coefficient indicates higher relative delinquency rates for accounts in lower income tracts. This result is certainly consistent with the notion that ceteris paribus, low income families are more likely to be delinquent with their water bills.

While (11) yields some interesting results, our major concern in this part of the study is determining whether or not increases in user fees have a differential impact on low income consumers. To empirically address this question, quantitative and qualitative dummy variables are employed in the following manner:

$$\underset{}{DEL} = \underset{(30.25)}{.248^*} + \underset{(20.19)}{.230\ MP^*} + \underset{(4.64)}{.122\ LYD1^*} + \underset{(5.64)}{.214\ LYD2^*} + \underset{(3.49)}{.0003\ W^*} \qquad (12)$$

$$R^2 = .012$$

where

LYD1 = 1 if household is in a Census Tract with 15% or more households below the poverty line[10]

LYD1 = 0 otherwise

LYD2 = LYD1 x MP

t values are in parentheses and * significant at least at the 5% level.

As defined, LYD1 and LYD2 are low income intercept and slope dummy variables respectively. These variables allow one to test the hypotheses that accounts in low income tracts tend, on the average, to have different delinquency rates and that delinquency rates for consumers in these areas respond differently to fee changes then they do in other tracts. As can be seen, the estimated results of equation (12) are supportive of the expectation that ceteris paribus, consumers in lower income tracts tend to have different levels of delinquency rates and exhibit different delinquency responses to changes in marginal fee levels. Specifically, the positive and significant sign of the coefficient for LYD1 indicates that other things being equal, consumers in lower income tracts tend to have higher DELQ values. Further, the positive and significant value for the LYD2 coefficient translates into the observation that a given increase in MP will lead to greater increases in DELQ values for consumers in low income tracts than for consumers in other areas. Figure 19 provides a visual interpretation of the results of regression (12).

Thus, unlike the rather weak results of the aggregate approach taken in previous sections, the findings using indivdual account data show that a strong statistical relationship exists between fee increases and delinquencies. Undoubtedly, the reason for the lack of results in the previous section was the small number of observations (and thus degrees of freedom) and the inability to control for other factors affecting delinquencies (especially income). To demonstrate that this may indeed be the case, the individual account data for Columbia were aggregated to monthly totals. Thus, rather than the many thousand observations available when using the individual account monthly data, we now have twelve observations, one for each month (July 1980 to June 1981). The regression results using this aggregated data for Columbia is:

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[10] In 1979 the poverty line for a family of four was $7,412.

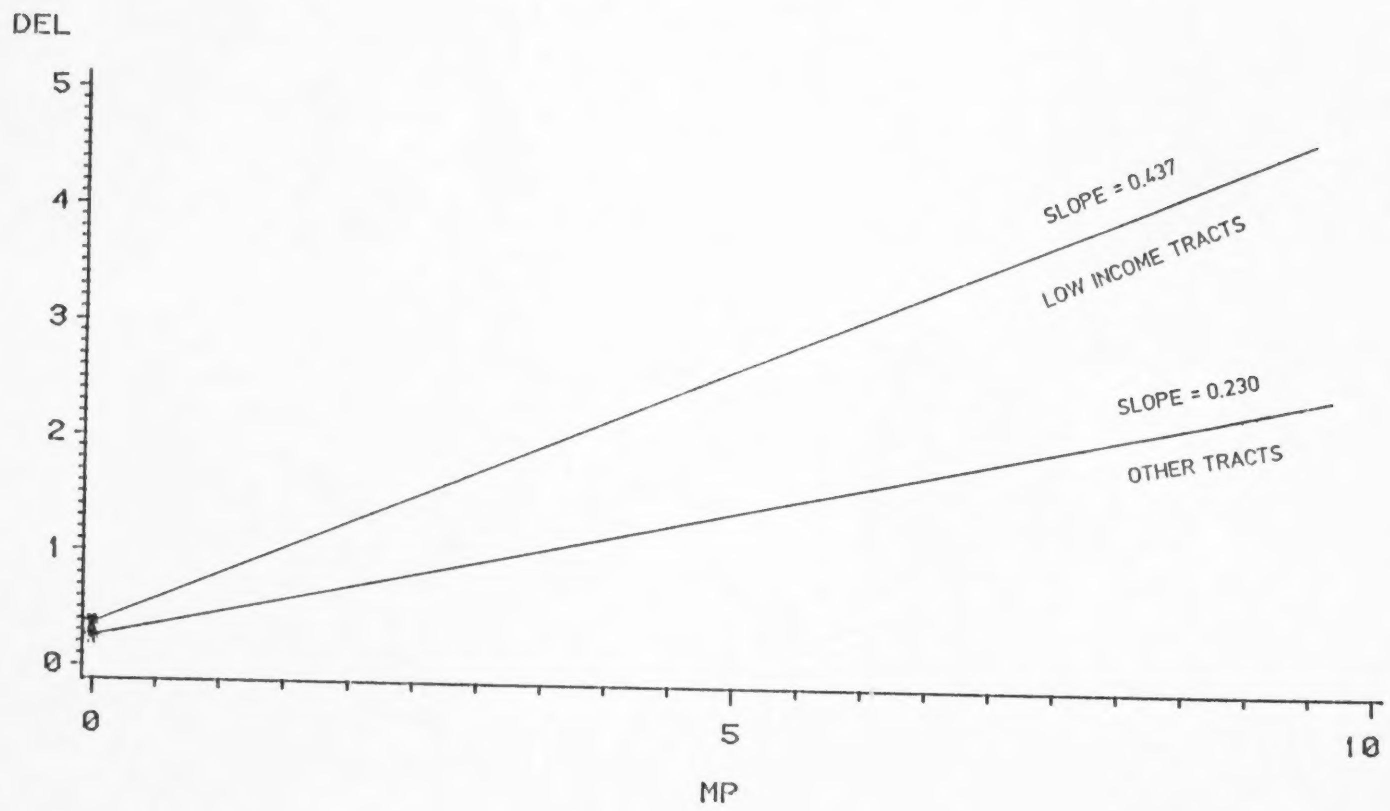

FIGURE 19. INTERPRETATION OF REGRESSION 12

$$\text{AVDELQ} = .494^{*} - .126\ \text{AVMP}^{*} - .0001\ \text{W} \quad (13)$$
$$(128.62)\ (-23.29)\quad (-1.76$$

$$R^2 = .98$$

where

AVDELQ = sum of the DEL values for all customers each month divided by number of customers each month

AVMP = sum of the MP values for all customers each month divided by number of customer each month

t values are in parentheses and * significant at least at the 5% level.

As can be seen, the price variable (AVMP) in this regression is highly significant but has the wrong sign. In looking at the data, average aggregated delinquencies actually declined over the period, while the average marginal price paid by consumers obviously increased. Thus, the results of (13) are not really surprising. The explanation of this is that factors other than the small price increase have cused average delinquencies to decline. Using the individual account data, we get more variation on the price variable (city vs. not-in-city difference plus the mid-period fee increase) plus the ability to control for income variations. It would then seem logical to conclude that the results of regressions (11) and (12) are more reflective of the true relationship between price and delinquency rates.

THE "BURDEN" OF USER FEE INCREASE: A SUGGESTED APPROACH: SOME EMPIRICAL RESULTS

The concern of Study C is how increases in user fees for water and sewer services impact on low income users. To this point, the emphasis has been on various indicators of non-payment (i.e., delinquencies and cut-offs). In this section, we address the more general issue of assessing the "burden" such fee increases place on low income residents. The interest is in determining how serious an effect these increases have on low income households budgets. While saying a given effect represents (or does not represent) a "serious burden" constitutes a value judgment or equity concern, this does not diminish the importance of addressing such issues.

The approach taken relies on consumer theory in that a simple demand model for water service is specified. The model is estimated using the data set described in the previous section and is specified in such a manner as to allow the calculation of price elasticities for consumers in different consumers adjust their water consumption in response to fee increases. The consumption adjustment estimates can then be used to simulate how an "average or mean" household's water and sewer bill would change given some specified increase in user fees. The idea, of course, is that consumers do adjust consumption patterns to price changes and that any "burden" estimate should include such adjustments. Finally, the estimated water and sewer bill changes could then be compared with other household budget items to see if indeed it appears that rising water rates place a "serious burden" on low income households. It is at this point where the value judgment must be made.

The demand model to be estimated follows very closely the specification suggested by Billings and Agthe (1980) and is also quite similar to the delinquency regression (12) in the previous section. The concern here is with how changes in marginal price lead to changes in consumption for different income groups. The model and its estimated results are then:

$$Q = \underset{(103.71)}{15.767^*} - \underset{(-24.33)}{4.962\ MP^*} - \underset{(-6.96)}{2.284\ LYD1^*} + \underset{(3.03)}{1.142\ LYD11^*} \qquad (14)$$

$$\underset{(-12.82)}{-2.449\ LYD2^*} + \underset{(7.70)}{2.097\ LYD22^*} + \underset{(2.94)}{.003\ W^*}$$

$$R^2 = .007$$

t values are in parentheses and * indicates significant at least the 10% level

The variables in (14) are defined as follows:

Q = household's water consumption in a given month (100 cf)

MP = price charged in a given month per 100 cf for the first consumption block

LYD1 = 1 if household is in Census Track with 15% or more households below poverty line

0 otherwise

LYDII = LDY1 x MP

LYD2 = 1 if any household is in a Census Tract with between 5% and 15% of the households below the poverty line

0 otherwise

LYD22 = LYD2 x MP

W = weather variable; same as defined in the previous section.

The results of (14) can then be used to calculate price elasticities for consumers found in three different groupings of Census Tracts: a) with 15% or more of households below the poverty line; b) those with 5% to 15% of households below the poverty line; and c) those with less than 5% of households below the poverty line. These calculations are as follows:

A) 15% or more below the poverty line

i) $e = \frac{dQ}{DMP}\frac{MP}{Q}$ with MP and Q being means

ii) $\frac{dQ}{dMP} = -4.96 + 1.41 = -3.55$ (from 14)

iii) $\frac{MP}{Q} = \frac{.67}{11.14} = .060$

iv) $e = (-3.55) \times (.060) = \underline{-.213}$

B) 5% to 15% below the poverty line

i) $e = \frac{dQ}{dMP}\frac{MP}{Q}$

ii) $\frac{dQ}{dMP} - -4.96 + 2.10 = -2.86$ (from 14)

iii) $\frac{MP}{Q} = \frac{.63}{11.55} = .054$

iv) $e = (-2.86) \times (0.54) = \underline{-.154}$

C) less than 5% below the poverty line

i) $e = \frac{dQ}{dMP}\frac{MP}{Q}$

ii) $\frac{dQ}{dMP} = -4.96$ (from 14)

iii) $\frac{MP}{Q} = \frac{.72}{12.26} - .059$

iv) $e = d(-4.96) \times (.059) = \underline{-.293}$

As can be seen, the demand for water services is quite price inelastic for all three income groups.[11] The most inelastic group, however, appears to be the middle low income group (consumers in Census Tracts with 5% to 15% of the households below the poverty line). Here, a 1% increase in price (MP) results in only a .15% decrease in water consumption (Q).

The next step is to use the above elasticities to calculate the effect of a hypothetical price increase on the monthly water and sewer bill for an "average" consumer in each of the three categories. In these calculations, we assume a 20% increase in the mean price for each group is implemented; that the minimum water and sewer charge does not change; that all consumers in each group reside within the city, and that marginal fee for sewer services remains fixed. With these assumptions, the changes in the water and sewer bill for the "mean" consumer in each group is:

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[11] These elasticities might be compared to the calculated price elasticity for all observations. Using an estimated model of the form Q = f (MP, INC, W), one finds an elasticity of -.177. Here, MP is marginal price, INC is mean 1980 family income and W is the summer weather variable. The measures reported here are quite similar to those in Helms and Vallery (1980). An alternative form for the demand equation was also examined. This was a flow adjustment model as discussed in Carver and Boland (1980). This model included lagged consumption (2 month lag) as an explanatory variable in the form $Q = f(Q_{-2}, MP, INC, W)$. The calculated elasticity from this model was -.15, not greatly different from that found with the above specifications. These results are shown in Appendix B.

A) 15% or more below the poverty line

   i) with MP = $.67 Bill = $11.54

   ii) with MP = $.80 Bill = $12.00

   iii) % change in Bill = 4.0%

B) 5 to 15% below the poverty line

   i) with MP - $.63 Bill = $11.64

   ii) with MP - $.76 Bill = $12.35

   iii) % change in Bill = 6.1%

C) Less than 5% below the poverty line

   i) with MP - $.72 Bill = $13.19

   ii) with MP - $.86 Bill = $13.59

   iii) % change in Bill = 3.0%

Thus, the group most adversely effected by the MP increase are those in the "middle" poverty Census Track (group B above). Here, a 20% water fee increase results in over a 6% increase in monthly water and sewer bill for the average consumer in these areas. The percentage increases found in the poorest and most affluent areas are roughly half this amount. The reason for this difference is the extreme inelastic nature of demand for these consumers resulting in very small reductions in water consumption as price increases are implements.[12]

To provide some background information on the three categories of census tracts used above, Table 16 contains information on income, race and housing conditions for each group. As expected, the income diffeences are substantial. The mean family income in the 0 to 5% group is nearly three times that of the 15% or more group. Also, the highest income tracts are nearly 90% white, while the lower are over 80% black. Finally, the housing measures in the last two columns indicate rather significant differences in value (and undoubtedly quality and conditions) existing between the categories at the two extremes. It is also worth noting that the "middle" group (5-15% below poverty) is much closer in these characteristics to the higher group of tracts than it is to the group with the greatest incidence of poverty.

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[12] Determining exactly why the "middle" poor group is less responsive to price changes is beyond the scope of this effort. One hypothesis might be that the more affluent consumers cut consumption by undertaking water conserving repairs (i.e., fixing leaks, etc.). The poorest consumers are forced to conserve by cut-offs as their delinquencies rise. The middle group, who can not afford repairs but do pay their water bills are thus found to have the smallest measured price elasticity. This, of course, is only one possible explanation.

TABLE 16. INCOME, RACE, AND HOUSING CHARACTERISTICS

BY CENSUS TRACT CATEGORIES[13]

Category: Percent Below Poverty Line	Number of Tracts	Mean Income	Percent Population White	Mean of Median Value Owner-Occ. Housing[14]	Mean of Median Contract Rent[14]
A) 15% or more	10	$11,315	17.7	30,418	137.55
B) 5-15%	15	23,944	81.4	96,009	388.58
C) 0-5%	21	28,891	89.6	135,291	361.09

The final concern is to assess how serious the estimated changes in water/sewer bills are, especially in terms of the burden placed on consumers in low income areas. As suggested, on approach might be to compare the above estimates of changes with other household budget items. Unfortunately, a search for such information (expenditures on "typical" household goods by income class) was not successful. However, some rough comparisons cn be made using consumer survey data on electricity and natural gas expenditures for two New Mexico utilities (see Ray and Stevenson, 1980). The data include average annual expenditures and average expenditures as a percent of average annual income for different income and age groups covering each of these energy sources. For the lowest income group (less than $7,000 in 1978), consumers spent $264 (6.6% of their income) on electricity and $261 (6.5% of their income) on natural gas. Making what is admittedly a very tenuous comparison, the estimated $11.54 montly bill for the average consumer in the lowest income census tracts ($138.48 annual expenditure) then might represent about 3% of their income. Further, the $.46 per month income resulting from the hypothetical price increase ($5.52 annual increase) is perhaps only a .1% of this consumer's income.[15] While these comparisons are offered for illustration only, they do imply that relatively small increases in marginal price may place little additional financial burden on low income consumers.

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[13] Source: 1980 Census Tract Data, Columbua SMSA

[14] Calculated by dividing the sum of median values (median rents) by the sum of the number of owner occupied (renter occupied) units.

SUMMARY AND OBSERVATIONS FOR SECTION V

This study has provided some empirical evidence related to the impact of fee increases for water services on low income consumers. We began by using aggregated monthly data for three service areas to study the relationship between fee increases, delinquency rates and cut-offs. The results of this effort were mixed, resulting mostly from the inability to control for factors other than price which could influence variations in delinquencies and cut-offs. Only for Augusta, with its large number of observations and the ability to at least indirectly control for income variations, were the results supportive of the hypothesis that higher user fees result in greater delinquencies. This conclusion was further supported using the individual account data available for the Columbia, South Carolina SMSA. Here, relative delinquencies (dollars over-due per 100 cf of consumption) were found to be positively influenced by the ex ante marginal price of water. It was also observed that accounts in lower income Census Tracts tend to have higher delinquencies for these accounts than for those in other areas. Finally, in an attempt to assess the burden of a fee increase on low income consumers, a demand for water services model was estimated using the Columbia data and changes in water bills were simulated for accounts in different groupings of Census Tracts. The results of this effort seem to indicate that modest fee increases (20% in our example) result in a small additional financial burden on low income consumers.

The implications of this study for policy makers and those concerned with pricing issues for municipal water services is several. First, the estimates support the literature which finds the short-run demand for water services to be quite price inelastic. This implies that fee increases will result in increased total revenue for the utility. Second, the results also indicate that fee increases will lead to higher delinquencies per 100 cf of water the utility sells. Since there are costs involved in the collection efforts and cut-offs (and reconnections) associated with rising delinquencies, this finding also has implications for the financial position of water utilities. This finding has certain equity implications in that it at least raises the issue that low income consumers may have some difficulty in paying higher water and sewer fees. Finally, the report outlines a methodology for examining the burden of user fee increases on low income consumers. It is hoped that this procedure will serve as a prototype for utilities who desire an assessment of how fee increases will affect their low income consumers. While the results presented are certainly tentative, it appears that for the Columbia area, modest fee increases result in rather small increases in the bill for the "average" low income consumers. It would not be prudent to generalize these results to all service areas or over all price ranges.

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[15] Even these rough estimates may overstate the additional burden of the fee increase. As stated, the lowest income group used in Ray and Stevenson (1980) is $7,000 or less. The "low income" group for this study include those accounts in Census Tracts which had a mean 1980 family income of $11,315 (see Table 5).

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APPENDIX A

QUESTIONNAIRE: STUDY A
FOR UTILITY OFFICIALS

SECTION A

The Interviewee(s)

(1) Name(s)____________________ ____________________

(2) Official Title(s)________________ ____________________

(3) Phone No. ____________________ ____________________

(4) Full name and address of the utility ________________________

The Utility

(1) Average volume of water pumped daily (estimated M.G.D.)________

(2) Maximum pumping capacity (estimated M.G.D.)________________

(3) Approximate number of clients:

	In City		Outside City	
	Water	Sewer	Water	Sewer
Residential customers (single-family & multi-family)	____	____	____	____
Other customers (all types)	____	____	____	____

(4) Official's view of the character of the service area: e.g., use the terms rural, urban, suburban, metropolitan in your description:

____

(5) Please give an estimate of the total population of the utility's service area. This estimate should include both customers and non-customers:

____

____

(6) Under what code(s) does the utility operate? (e.g., appropriate resolutions of the state legislature; resolution of the city or county council or of a public service district commission; a city or county code of regulations or ordinances; bond convenants. (Do not include laws and regulations which apply to all utilities in the state). See guidelines.

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____

SECTION B: User Charges

Could you please give me a copy of the charge schedule for water and sewer services?

If a schedule is available, the interviewer should review it and ask for clarification of any points not obvious to him. The clarifications should be written on the schedule itself.

If no schedule is available ask the official to give the pertinent facts of the user charge structure, and record the details on the back of this page.

SECTION C: Other Charges

(1) Tap-in-charges and impact connection fees:

A. How much does it cost the ordinary householder to tap-in to the water system? To the sewage system? (Assume the line already extends to the householder's property line). Make an estimate of all charges--tap-in fees, front-foot assessments, impact fees, estimated plumbing costs, etc. Mention any assumption you make in this estimate.

Water ____

____

Sewage____

____

(2) Do the tap-in fees reflect the actual average costs (labor and materials) of a hook-up?

____

(3) A. If there a requirement in force that all households withing a fixed distance (say 200 ft.) of a water or sewer line must hook-up?

B. If they do not, does the utility bill them for its base charge or for an availability fee or any other type of water or sewer charge?

(4) Line extension policy

A. When a householder or group of householders living some considerable distance from a water or sewer line request to tap-in, or when a developer requests to tap-in, who decides whether they will be hooked up?

____

B. Some utilities have established predetermined policies for adding new customers: e.g., if over 50% of the householders in a neighborhood sign a petition and 25% of them pay tap-in fees and certain other charges in advance, then the line will be extended to the neighborhood. Please briefly describe any such policies your utility has:

For single residences______________________________

____

For groups of residences ____________________________

____

For developers_________________________________

____

C. Even if the potential customers meet the conditions described in the previous question (4B), a utility may decide not to extend the line or to defer extension. Based on your past experience which of the following factors are important in making that decision. Please make the following factors in terms of their importance (1, 2, 3, 4, . . . etc.) If the factor is of no importance write zero.

	Inside City	Outside City
1) the cost of the proposed extension; budgetary limitations.		
2) how much of the cost can be recovered through tap-in fees.		
3) how much of the cost can be recovered through impact connection fees.		
4) how much of the cost can be recovered through user charges.		
5) planned growth considerations; if the neighborhood is expected to grow; or if a line extension to the neighborhod will provide access to other growth areas		
6) the amount of unused water or sewerage treatment capacity.		

7) other factors (describe)________________________________

(5) Do you personally know of families who live within the fixed distance (say 200 ft.) or a water or sewer line and who would like to tap-in, but who feel unable to pay the total cost of hook-up? Yes ___ No ___ If the answer is yes, approximately how many families?

(6) Do you personally know of families who live at some considerable distance from a line, who would like to tap-in, but cannot because either (1) the utility has determined that the line cannot extend at this time of (2) the families feel unable to meet the estimated costs of the hook-up. If the answer is yes, approximately how many families?

Case (1) _________
Case (2) _________

(7) Has the utility ever considered lowering total hook-up costs to encourage greater usage of its services. What, is your opinion, are the chief arguments for and against this?

____

____

2 OF 2

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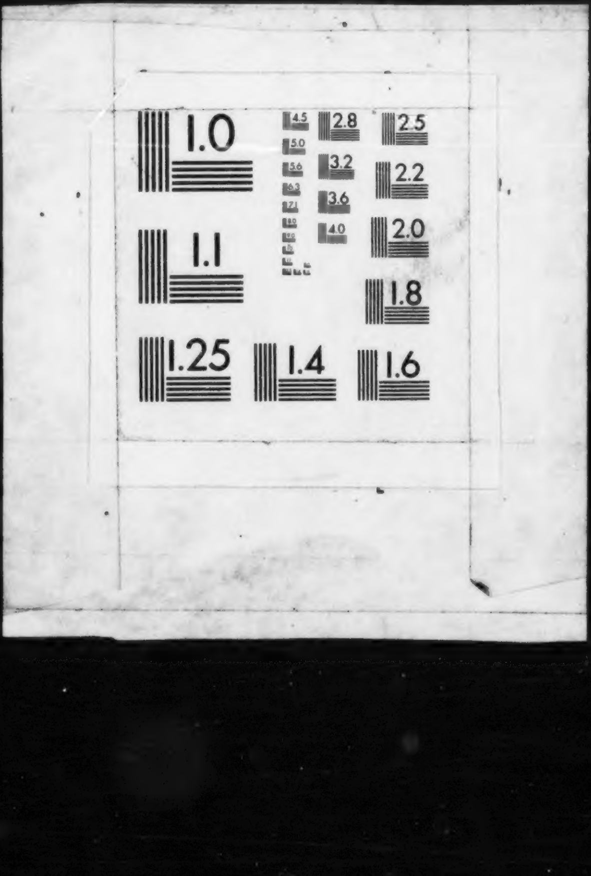
1.0
4.5
2.8
2.5
5.0
5.6
3.2
2.2
6.3
3.6
7.1
8.0
4.0
2.0
1.1
1.8
1.25
1.4
1.6

II. Initial Deposits

1. Does the utility require a deposit for water and sewage. If so, how much?

   ____

2. Are these true deposits or merely advanced payments?

   ____

3. If deposits are paid, does interest accumulate on the amount?

   ____

4. On average, how soon after the last bill is paid, does the utility return deposits?

   ____

III. Are there any other charges eg., special assessments, mileage, etc. which the utility requires.

Detail: ____

SECTION D

Billing Procedures

1. Is billing carried out on a monthly, bimonthly, or quarterly basis? (circle one)

   If billing is bimonthly or quarterly, please answer question (2)
   If billing is monthly pass on to question (3)

2. a. Has the utility ever considered converting to monthly billing?

   b. Has estimates been made of the extra costs of monthly billing? Roughly what were these extra costs?

   ____

   c. Would prorating (i.e., reading the meter only every quarter but estimating monthly usage) reduce the costs of monthly billing?

   ____

   ____

3. Has the utility ever used prorating techniques to estimate bills? e.g., in the case of excessive consumption caused by leaks, or in cases where a faulty meter has caused high readings.

____

____

4. Have you any personal opinion as to customer acceptance (or otherwise) of prorating?

____

____

5. Does the utility give a discount for prompt payment of bills? If so:

How much? __________

Up to what date? __________

6. Is a surcharge made for late payment of a bill? If so:

How much? __________

Payable after what date? __________

7. Has the utility ever experimented with a senior citizen's discount? Give details.

____

____

____

SECTION E

Debt Collection

1. Please given an account of your exact billing method: give a chronological, day by day account from the first billing, through notification, to actual cut-off of services.

a. ______________________________________

b. ______________________________________

c. ______________________________________

d. ______________________________________

2. Is the grace period strictly enforced? i.e., Do you cut off all customers who fail to make payment by the final date? Or only those who fail to give an adequate explanation by phone or by personal appearance at the billing office?

3. Do you permit partial payments? Under what conditions? Explain any policies the utility has.

4. Which official or group of officials makes the decision to accept a partial payment or to permit a customer to pay off a debt in monthly or bimonthly installments?

5. What is the approximate delinquency rate? e.g., the rate for a utility which uses bimonthly billing will be:

$$\text{Rate} = \frac{\text{\# of customers on March 1st who have not paid their bills for the January-February period}}{\text{total \# of customers in service area during January-February period.}} = \_\_\_\_\_\_\_\_$$

6. How much user charge revenue is incollectible on an annual basis. For the last fiscal year what is the ratio:

$$\frac{\text{uncollectible service charge debt}}{\text{total service charge revenues collected.}} = \_\_\_\_\_\_\_\_$$

7. What is the approximate cut-off rate? i.e.

$$\frac{\text{\# of customers cut-off during a billing period}}{\text{total \# of customers in that billing period}} = \_\_\_$$

8. Roughly what % of customers who have been disconnected are reconnected?

____

9. Is there a reconnection charge?

____

10. Has the utility ever attempted to collect customer debt by placing liens on property or by using a collection agency. Please detail. ____________________________________

____

11. Do you notify the Public Health Authority when the utility cuts off water supply to a customer? Indicate whether this is done automatically, sometimes, only in special case, etc.

____

____

12. a. Do you notify any other local government authority? e.g. A housing authority

____

b. Have you ever become aware that a public health hazard has been created through the disconnection of water supply (an hence sewage service) to households.

1. in a congested urban neighborhood? ____________________

2. in a rural area? __________________________________

c. Subsequent to a cut-off, what conditions are likely to occur which increase the risk of hazards to health?

____

d. Is any action taken or advice given to avoid such a hazard?

____

e. Are occupants allowed to remain in residences which has been disconnected?

____

f. If the anwswer to 5 is yes, please describe conditions under which continued occupancy is likely to be allowed.

____

13. a. Have the public health authorities or any other government authorities such as Human Service Agencies ever requested that the utility resume services to a customer or a group of customers?

b. On what grounds has this request been made?

____

c. How frequently has this happened?

____

d. Does the utility comply?

____

e. Who pays the bill in such cases?

____

14. a. Do families living in apartment complexes whose landlord becomes delinquent sometimes complain to the public health authorities, asking them to persuade the utility into resuming service? Or do they complain directly to the utility?

____

b. What is done is such cases?

____

15. Do you know of any government agencies or any private charities which pay the water and sewage bills of low income families? Details and addresses if possible.

____

____

____

SECTION F

Records

Please give information on available records which a researcher could study to calculate monthly or bimonthly delinquency rates and cut-off rates before and after a substantial increase in user charges. Such records as look-out sheets, route books, computer print-outs, and client files would be useful here. Are these records accurate and complete?

____

____

____

In what recent years did substantial user charge increases occur? Please give details:

____

____

____

APPENDIX B

Letter to Director of Public Works

Dear Sir:

Implementation of the regulations associated with the Safe Water Drinking Act (S.W.D.A.) of 1974 has had a significant impact on affected communities. To raise needed revenue for installation of adequate control technology, many utilities have implemented large increases in water and sewer user charges.

In certain instances these increases may have increased delinquency rates and cut-off rates. It is probable also that the increases may have posed a significant hardship on certain classes of user, for example on senior citizens and others on fixed incomes.

Every utility must, of course, in order to operate effectively, recover adequate service charge revenues. Yet there are wide variations in user-charge structures, billing procedures, debt collection policies, etc., even between utilities which have approximately the same number of customers and similar service areas. It is likely that some procedures and techniques are more effective than others in being cost effective and in ensuring that adequate revenues are collected on the one hand; and on the other hand in placing the least burden on low income families, and being advantageous from a public health and community standpoint.

We have recently been awarded a small grant to research the issues described above. Your utility is one of thirty whose techniques and procedures, we wish to study. Would you be so kind as to

(i) assign a utility official to answer the key questions on the enclosed questionnaire. The document "Guidesheet to Key Questions" (also enclosed) indicates how to respond.

(ii) grant us a 20 minute interview with a billing official who can answer the questions on the questionnaire which deal with the basic facts about your service charges, billing procedures, debt collection method, etc.

(iii) grant us a one hour interview with yourself or another official who can answer the questions dealing with utility policies.

Any information which you provide to us will be kep confidential, and in any resulting publications will only be cited or used anonymously, both with regard to the individual and the utility.

The potential benefits which may result from this study are these: The research group:

a. will develop recommendations as to how utilities can assist families severely impacted by high or increases user-chargers.

b. will develop suggested guidelines for financial practices which are both cost-effective and have advantages from a community standpoint.

c. will provide questionnaires and survey methods which utility officials can use to assess the effects of new billing procedures and proposed or actual user-charge increases on their customers.

A copy of the final report will, of course, be mailed to you. We will contact your shortly by phone.

Thanking you in advance for any help you give.

GUIDESHEET TO KEY QUESTIONS

PAGE 1 The Utility: Questions (1) and (2)

Self-explanatory

PAGE 2 The Utility: Question (3)

Please given an estimate of the number of households you currently serve. This number should include households in apartment complexes and in duplexes. (In the case of apartments and duplexes where the household are not separately matered estimate the number of household units).

PAGE 1 The Utility: Question (4)

Please give a general description such as

> "about 1/3rd of the customers live in a rural area; 2/3rds are urban."
>
> "approximately 50% of customers are in the metropolitan area, the remainder are suburban."
>
> "just over 70% of the billed accounts are in rural locations the rest surburban."

PAGE 1 The Utility: Question (5)

This question requests an estimate of the actual population living in the service area (both in-city service area and service area outside the city). The estimate should include both users and non-users of water and sewage services. If you are unable to make this calculation, please indicate how such an estimate could be made. What planning authorities or census data should be consulted?

PAGE 2 The Utility: Question (6)

A. A brief statement indicating the authority structure of the utility eg.

"the utility is run by the City Council; the Director of Public Works, a salaried official, is the chief executive."

"The utility is an independent body under the State Legislature, managed by six Public Works Commissioners (3) are elected."

B. Summarize briefly any special ordinances, resolutions, laws, etc., deal with the utility's obligations to its customers - on these issues:

(i) whether in-city customers must be given preference.

(ii) where the utility's mode of operation must minimize health hazards in the community.

(iii) whether the utility has any obligation to maximinize the social amenity of the community, or must operate only on the basis of cost-effectiveness.

Typical partial answers would be:

"There is an ordinance probiting extension of sewer service to individual customers out-side the city limits."

"Under our rate structure, users outside the city pay more for services received."

"Under the line extension code, in-city customers get hook-up preference."

"A municipal ordinance requires that all potential health hazards observed by utility officials be notified to the public health."

"A city council resolution permitting the acceptance of partical payments under certain circumstances was intended to increase social amenity."

"The lower water charges during the irrigation months improve social amenity."

PAGE 8 Question (%)

When estimating the delinquency rate the general formula is:

$$\frac{\text{\# of customers who have not paid their bills for billing period 1 at the beginning of billing period 2}}{\text{the total number of active billed accounts in the service area during billing period 1}}.$$

Count all active, billed accounts whether they are residential, commercial, or industrial.

Leave your answer in the form of a ratio eg.

For the billing period 1 June to 30 June the delinquency ratio was:

$$\frac{\text{692 customers delinquent}}{\text{14,514 total customers}}$$

PAGE 8 Question (c)

The information for this question is usually obtainable from the annual audited accounts, or from internal financial reports. The ratio for the previous fiscal year should be used if possible. Otherwise give the figures for a quarter or 6 month period.

As with the previous question leave the response as a ratio eg.

For F. Y. 1980

$$\frac{\text{uncollectible service charges}}{\text{total service charge revenues collected}} = \$\ \frac{7{,}876}{168{,}654}$$

PAGE 8 Question (7)

Count only those customers who were actually physically disconnected. If the cut-off notice was sent out, but the customer paid his account just before cut-off occurred that does not count as a cut-off.

Again, give your response as a ratio and indicate which billing period the ratio refers to.

APPENDIX C

QUESTIONAIR STUDY B

CONSUMER SURVEY

(Head of Household)

1. What is your name?

   ____

2. Your residential address?

   ____

3. Do you rent ( ) or own ( ) the place of residence? Yes ____
   No ____

4. Do you receive bills for both water and sewer service directly from the ____________________________________. (The interviewer will name the water and wastewater utility.) Yes ____
   No ____

   If the answer to this question is no, the interview is terminated.

5. How long have you been a customer? ________________________________

6. How many persons live in your household? (Do not include persons who are billed separately for water and sewage services.) ___________

7. What is your occupation? ____

8. What is your yearly family income (approximately)

   a. $ 0 $ 3000
   b. $ 3000 $ 6000
   c. $ 6000 $ 9000
   d. $ 9000 $12000
   e. $12000 $15000
   f. Above $15000

9. Are you satisfield with the services provided by the water and sewer utility. ______________________________

10. If your answer is no, please explain why you are not satisfied.

11. Are you billed:

    a. monthly
    b. bimonthly
    c. quarterly
    d. yearly
    e. other arrangement ______________________

12. How much do you usually pay for your water and sewage bill? Please given an average amount. (The interviewer may have to estimate an average from information given by respondent).

    Water = $ _______
    Sewer = $ _______

13. Do you know how water and sewage bills are calculated? Yes __ No __
    If the answer is yes:

14. Please give a brief explanation of how it is done. (The interviewer should summarize the essentials of the respondent's explanation.)

15. When did you move into your present home? ____________________

16. Did you or other members of your household pay the tap-in fee to connect this dwelling to the waterlines? Yes _______ No _______
    If the answer is Yes, what was the approximate amount? __________

17. Did you pay a deposit for water and sewage service? Yes ___ No ___
    If the answer is Yes, what the approximate amount? ______________

18. Will you get back your deposit when you move? Yes _____ No ________
    Don't know _______

19. Will you be paid interest on it? Yes _____ No _____Don't Know _____

20. Has there been any significant increase in your water and sewer bills in the last two years? Yes_____ No _____ Don't know _____

21. If the answer is yes to the above question, please say approximately when, and indicate how big the increase was.

22. Have you exer experienced problems in paying your water and sewage bills? Yes_____ No _____

23. If the answer is yes, explain the nature of your problem.

24. Are you allowed to make partial payments on your water and sewage bills? Yes _____ No _____ Don't know _____

25. If the answer is Yes: How do you go about making a partial payment?

26. Have any of your bills been prorated? (Interviewer will explain meaning of term). Yes _____ No _____ Don't Know _____

27. How do you feel about having your meter read every two months and you be billed for half the amount each month.

28. Do you know of any discount you receive for paying your bills promptly. (Interviewer: explain the term if necessary). Yes ___
No ___

29. Do you know of any discount you must pay if you are late in paying a bill? Yes _____ No _____ What is the amount $______

30. When does your monthly bill reach you?

31. When does the bill become delinquent?

32. Do you know the cut-off procedures? Yes _____ No _____
If yes, please explain the procedures.

33. Do you know the re-connection procedures? Yes _____ No _____ If yes please explain.

34. Has your water supply ever been disconnected?

a. at this address Yes_____ No _____
b. at any other address within the same service area Yes___ No___

35. If so, when and for how long was it disconnected? Please give full details of all periods of disconnection.

36. What was the source of your water supply during the cut-off period? Please give details

a. neighbors

b. other members of your family

c. well-water

d. pond or stream water

e. other source (please describe)

37. How did you transport water during the cut-off period? Please give details.

a. by bucket or other metal container

b. by rubber hose

c. other method of transportation

38. How did you store water? And what was the maximum length of time it was stored?

39. Do you know of any agency which can help you pay your water bill? Yes _____ No ____

40. Are you satisfied with the quality of your water supply? Yes ___ No ___ If no, please explain.

41. Do you have a washing machine in your home? Yes_____ No _____ On the average how many times do you use it each week? _______

42. Do you have a dishwasher? Yes _____ No _____ About how often do you use it?

Less than once a day? ____________
About once a day? ____________
About twice a day? ____________
More frequently than twice a day? ____________

43. How often do you wash cars at home?

Very often ________
Often ________
Occasionally ________
Never ________

44. How often do you water your lawn in the summer?

Very often ________
Often ________
Occasionally ________
Never ________

45. How often do you water your garden?

Very often ________
Often ________
Occasionally ________
Never ________

46. About how frequently does each member of your family take a bath or shower?

Twice a day ______
Every day ______
A few times a week ______
Less frequently than a few times a week. ______

APPENDIX D

CORRELATION COEFFICIENTS

Correlation coefficients (p-value) for Disconnection Rates (%) versus minimum/average charge ratio (see figures 1-3)

Rural	0.03647	(0.9203)
Nonmetropolitan	0.16542	(0.6479)
Metropolitan	-0.00723	(0.9842)

Correlation coefficients (p-value for Disconnection Rates versus minimum periodic charges (see figures 4-6)

Rural	-0.05573	(0.8785)
Nonmetropolitan	-0.39034	(0.2648)
Metropolitan	-0.13822	(0.7033)

For Delinquency Rates versus Minimum/Average Periodic Charge Ratios (see figures 7-9)

Rural	-0.15683	(0.6652)
Nonmetropolitan	0.34835	(0.3583)
Metropolitan	0.12283	(0.7353)

Annual Uncollectable Service Charge Debt versus Reconnection Fees (see figures 10-12)

Rural	0.65253	(0.1121)
Nonmetropolitan	0.46529	(0.2069)
Metropolitan	0.44338	(0.2319)

Reconnection Fee versus Disconnection Rates (see figure 13-15)

Rural	-0.11060	(0.7610)
Nonmetropolitan	-0.06936	(0.8490)
Metropolitan	-0.31259	(0.3792)

Grace Period Ratio verus Disconnection Rates (see figures 16-18)

Rural	-0.38960	(0.2658)
Nonmetropolitan	-0.52210	(0.1216)
Metropolitan	-0.15791	(0.68401)

APPENDIX E

WATER FEE SCHEDULES FOR COLUMBIA, SOUTH CAROLINA

June to December 1980

In-City		Out-of-City	
$2.00	0 - 300 cf	$4.00	0 - 300 cf
.30/100 cf	300 - 10,000 cf	.59/100 cf	300 - 10,000 cf
.34/100 cf	10,000 - 100,000 cf	.49/100 cf	10,000 - 100,000 cf
.29/100 cf	100,000 - 1,000,000 cf	.39/100 cf	100,000 - 1,000,000 cf
.25/100 cf	over - 1,000,000 cf	.34/100 cf	over - 1,000,000 cf

January to June 1981

In-City		Out-of-City	
$2.00	0 - 300 cf	$4.00	0 - 300 cf
.59/100 cf	300 - 10,000 cf	.89/100 cf	300 - 10,000 cf
.54/100 cf	10,000 - 100,000 cf	.79/100 cf	10,000 - 100,000 cf
.49/100 cf	100,000 - 1,000,000 cf	.69/100 cf	100,000 - 1,000,000 cf
.45/100 cf	over - 1,000,000 cf	.54/100 cf	over - 1,000,000 cf

---

NOTE: Accounts in split Census Tracts (where only a part of the tract was in the city) were assumed to pay city rates if over half the tract's 1980 population resided in the city.

APPENDIX F

ALTERNATIVE SPECIFICATIONS OF A DEMAND EQUATION

1. $$Q = \underset{(87.76)}{10.574^*} - \underset{(-29.49)}{3.719\ MP^*} + \underset{(41.38)}{.0002} + \underset{(3.15}{.003\ W^*}$$

   $R^2 = .014$
   * significant azt least to the 5% level

2. $$Q = \underset{(56.43)}{6.918^*} + \underset{(146.20)}{.344\ Q_{-2}^*} - \underset{(-18.64)}{2.445\ MP^*} + \underset{(25.15)}{.001\ INC^*} + \underset{(.64)}{.001\ W}$$

   $R^2 = .14$
   * significant at least to the 5% level